FOOD FACTS AND DIET PLANNING

FOR STUDENT & HOUSEWIFE

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BY

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AUTHOR'S PREFACE

As a lecturer on dietetics, I am frequently asked for the names of books on that subject. There are various large standard works dealing with it, but few of the smaller type of book which is so often desired. I have therefore produced this one in the hope that it may prove useful to the school girl, the domestic science student and also to the person who, while wishing to know something about the composition of foods and the principles of diet planning, has not the time or has not the inclination to study the very large volumes. It is hoped that it may so contribute a little to the spread of a knowledge of the science of nutrition, which is the keystone of the Arch of Health and is of such momentous importance to the nation as a whole.

I am grateful to the following publishers for allowing me to make use of figures and illustrations from their publications: Messrs. Macmillan & Co. for illustrations from Brimble's *Intermediate Botany*, Stenhouse's *Introductory Biology*, and Foster & Shore's *Physiology for Beginners*; The American School of Home Economics for diagram from Elliot's *Household Bacteriology*; H.M. Stationery Office for percentage values taken from Plimmer's *Analyses and Energy Values of Foods.*

I also thank the League of Nations for permission to reprint figures from their reports and Miss Sadie Kelly for drawing illustrations.

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PREFACE TO THIRD IMPRESSION

Dietetics is a subject which does not stand still, and in this impression the necessary additions and alterations have been made to bring it in line with present knowledge. As it goes to print the food situation is severely affected by the War, and, as the extent to which foods are available changes rapidly from day to day, no attempt has been made to conform closely to these changes. The intelligent reader, however, who has grasped the facts given about the composition and value of foods will know how to adapt this knowledge when substituting other foods for those which are scarce or which are not procurable.

PREFACE TO SECOND EDITION

In this edition extensive alterations and additions have been made to bring the work in line with present knowledge.

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CHAPTER I

FOOD FOR HEALTH—THE BODY'S REQUIREMENTS AND HOW TO PROVIDE FOR THEM

"The virtuous woman looketh well to the ways of her household and eateth not the bread of idleness."

PROVERBS, chap. 31, v. 27.

EVERYONE will admit that good sound health is the greatest treasure we can have, and yet it is only a very small proportion of the community who really enjoy what we might call perfect health. This does not mean that all the others are suffering from some actual disease, but consider for a moment the large number of people who have rheumatism, indigestion, sleeplessness and other disorders! If it were possible to trace the cause of such conditions it would not infrequently be found in the kind of food consumed. An old Chinese proverb has it that "All diseases enter by the mouth", and while the saying is much too sweeping to be accepted as a statement of fact, it is nevertheless of value in reminding us of the very great importance of good food in keeping us healthy and fit, and in pointing to the wisdom of knowing something about the constituents of various foods; having got this knowledge, it is then possible to plan a satisfactory diet.

THE FOOD SUBSTANCES

The human body may aptly be compared to a house; building material is necessary for its construction, and the daily wear and tear demands a continual repair to keep it in a satisfactory condition. In the case of the body the necessary building and

repairing materials have to be got from certain parts of our food in the form of **proteins** and **mineral matter**.

Like the dwelling house, the body requires fuel to keep it warm, and this is supplied by other foods in the form of **fats** and **carbohydrates** and by protein substances not used for building and repair. A slow combustion goes on between these and the oxygen which has passed from the air, into the lungs and then into the blood; this chemical action also provides the energy which is necessary to maintain life.

The term *energy*, so often used in connection with food, implies the power of the different organs to perform the work required of them; for example, the heart requires energy to beat, the brain to think, the muscles to perform the different movements of the body, and so on.

In addition to the food substances already mentioned there are the **vitamins** and these, as the name implies, are substances of vital importance in nutrition.

To understand how a particular food is going to nourish the body it is necessary to know which of the food substances it contains and the part played by each. These will therefore now be dealt with in the order given above, viz. proteins, mineral matter, fats, carbohydrates and vitamins.

PROTEINS.—The body is a great complex organisation of countless cells, each of which is unceasingly carrying out its own little piece of work and helping to produce in the individual what we commonly speak of as "life". All work, however, entails wear and tear, and the cells will break down if they are allowed to go on unrenewed; they will no longer be able to do their work, and in consequence the health of the individual will be seriously affected. We can thus understand why the early scientists, recognising the great importance of the repairing substances which are present in food, gave them the name protein, the derivation of which denotes "a substance of first importance". Well may they possess this name, as life can go on for only a short time if no protein is being supplied.

A protein is a complex substance containing the elements
.rbon, hydrogen, oxygen, nitrogen and sulphur combined to
rm chemical compounds called amino acids. About twenty of
.ese go to form proteins, the latter varying in their properties
id their value in the diet according to the type of amino acids
esent, the proportion of each, and the order in which they
e joined up with each other to form the protein molecule. We
ay compare them to a jig-saw puzzle or to children's picture
icks, where some of the sections are of much more importance
an others in forming the desired picture or design; for ex-
nple, a particular brick missing from the picture will probably
oil the whole effect, while another brick, absent from another
rt of the same picture, may be very little missed. Likewise,
me of the amino acids of proteins are more important than
hers for forming body tissue.

Proteins which contain a good supply of the important
nino acids are classified as *first class* or *complete proteins*, while
ose not so well endowed in this respect are termed *second class*
incomplete proteins. Generally we can regard the proteins
esent in animal foods, e.g. milk, meat, etc., as being first class,
d those in vegetable foods, e.g. pulses as being second class.

It is not necessary, nor is it advisable, for all the protein con-
med to be first class; about 37 to 50 gms. per day is an
equate amount and the rest should be made up of second
ıss or vegetable protein. It is an advantage to have a variety
protein foods so that one can make good the deficiency of
other.

When the protein of our food is digested, it becomes broken
wn into the amino acids; then the body, functioning
e a worker in a chemical laboratory, selects amino acids from
fferent proteins and arranges them to form the picture or
sign of the particular protein required. This varies according
the tissue which is to be repaired or built up; for example,
e protein which is present in the kidneys has a different
lesign" to that in the liver.

There are some amino acids which are not used for the formation of the body proteins and these are burnt as fuel. Waste substances from protein are excreted by the lungs and kidneys.

If the amount of carbohydrate in a diet is insufficient the protein taken will be used as fuel rather than as a tissue former; hence the need for a correct balance of food with the right amounts of tissue forming and energy giving substances.

Most foods contain some protein but those which may be regarded as rich sources are: meat, fish, eggs, cheese, pulses, nuts and—to a lesser degree—the cereals.

It is inadvisable to have either too little or too much protein in the diet. Although one may feel quite well on a diet containing a small amount of that substance the body is given little power to resist disease should that attack it. Over-consumption of protein foods, on the other hand, is frequently the cause of rheumatism and other ills. How then are we to know how to strike the desired medium? It is usually considered that about three ounces of protein daily is a satisfactory amount in the case of a man, but such figures are significant only to those who understand the arithmetic of diets and can work out the values from food tables. A more convenient rule of thumb method is required for those not familiar with such calculations, so it should be noted that if a good helping of a protein-rich food is taken at two meals of the day—or smaller helpings at three meals—this, along with the protein got in other foods, will make up the necessary amount. In the case of a man, for example, one egg for breakfast, about $\frac{1}{4}$ lb. of meat for dinner and 2 oz. of cheese for supper will give approximately 1·6 oz. protein. Alternatively 5 oz. of meat for dinner and $\frac{1}{4}$ lb. fish, either for breakfast or supper, will supply about this amount of protein. We can depend on the rest of the three ounces required being made up from the milk, cereals, etc., present in an ordinary diet.

Gelatine is a protein which lacks some of the important animo acids and is of no use for building tissue. It can be burnt

nd so gives heat and energy. Gelatine is present along with ther proteins in fish and in the flesh of young animals. It is lso present in bones and the value of stock made from these s due to the gelatine extracted from them by boiling. It is asily digested and is a quick source of energy.

MINERAL MATTER.—This contains the elements calcium, hosphorus, sodium, potassium, etc., in the form of compounds hich we call salts, e.g., calcium phosphate. Some of these elenents may also occur in organic combination with protein, etc.

These mineral salts play an important part in the strengthenng and hardening of bones and it will therefore be obvious that hildren should have an ample supply of them during the years hen the bones are growing. The best foods for supplying the articular salts most useful for this purpose are milk and eggs.

Mineral substances, however, have another use, making them ecessary in the diet of adults as well as of children; the blood hust always be mildly alkaline and the body has various ways f ensuring that this reaction is not disturbed. Alkalies are hortal enemies of acids and if they are brought together they ecome engaged in a struggle for supremacy. Now when acid npurities enter the blood they cause its alkaline reserve to be oo much reduced, and this is not good; but by taking foods ich in alkaline salts we are able to keep the balance as it should e. The state of the blood is a very important matter in health –if there is anything wrong with it everything else is likely to o wrong. Some people rely on the many kinds of alkaline salts btainable at the chemist's to destroy the acid, but a far better ay is to take enough of that type of food which gives alkaline nineral salts; the alkali-forming foods are milk and most fruits nd vegetables.

Mineral salts are also necessary for the formation of the arious secretions of the body, viz. the gastric juice, etc.

The special need for these mineral substances in the diet has ow become fully recognised and it is advisable to consider ome of them individually.

Sodium and Potassium.—Sodium is present chiefly in the fluids of the body and potassium in the cells of the soft solid tissues. The chief use of these substances is to maintain the right osmotic pressure between the cells and the fluids in contact with them. In this connection, those who have bathed in fresh water have probably felt the effect of wrong balance of pressure by the irritation produced on the mucous membrane of the nose if some water enters it; salt water, on the other hand, produces no such marked effect. Sodium occurs chiefly as sodium chloride—common salt—and while this is present as part of the composition of many foods it is also added to them as a flavouring agent. There is a greater demand for salt by the body when the diet is vegetarian; this is probably due to the large amount of potassium present in plant tissues, this element having to be balanced in the body by a sufficient amount of sodium. The well-known " salt licks " of herbivorous animals point to a craving which they have for salt.

If the body is deprived of salt it responds to the emergency by treasuring the quantity left in the tissues, and the amount excreted falls to as low as a tenth of the normal, and does not return to normal until the depleted reserves have been restored.

Calcium and Phosphorus.—Calcium is necessary for practically every tissue of the body; nearly seventy per cent of the dried constituents of bone consists of mineral matter, and a large proportion of this is calcium phosphate. If calcium is cut entirely out of the diet the muscles will at first become very irritable and later will lose their power, the nerves will cease to conduct messages, and the heart will eventually cease to beat. If too little calcium is supplied the blood loses its power of clotting, and the extraction of a tooth may prove to be a serious operation, while even a scratch may be dangerous. A child requires about twice as much calcium as an adult.

The table on page 8 shows the foods in which calcium is present.

Phosphorus is an important substance in the growth of tissue

as it is present in the nuclei of all cells. It is specially required by the bones and nerves; many nerve tonics on the market consist of compounds containing it. Like most other things, however, it is better if one can get it in the natural way, as from the foods shown in the table on page 8.

Iron.—This element is required to form the hæmoglobin or oxygen-carrying part of the blood; if it is insufficiently supplied, bloodlessness results. We can make the best use of it when it is in the form of food, but in severe cases of bloodlessness enough may not be got in this way and then pills and tonics containing it have to be administered. Liver is an excellent source of iron and this is one reason why it is so beneficial to anæmic people. Other foods containing iron are given in the table. The iron present in a food is not always all "available" and this must be taken into account when judging its value. For example, spinach and meat are rich in it but there is evidence that the iron from these sources is not fully made use of by the body, especially that in meat.

Iodine.—Iodine occurs in the form of salts known as iodides. These are necessary to the thyroid gland in the neck, which plays a great part in controlling the growth and development of the body; if this gland is not sufficiently active goitre may be contracted. The sea is rich in iodides and the spray, driven inland by the wind, causes these to be present in the water, in the soil and consequently in the crops; a sufficient amount of iodine to prevent goitre is thus provided. The parts of the world where the latter disease is very prevalent have become known as *goitre belts* and they are usually sheltered valleys, screened off by the hills from the spray-bearing winds. Incidentally, it is those foods associated with the sea which are richest in iodides, for example—all kinds of fish. Salt is got from marine deposits and contains iodide, but during the refining process this is removed; people who require it, however, can buy iodised salt from the chemist.

In places where goitre is prevalent potassium iodide is given

to school children, either by adding it in small quantities to water or—a more appreciated method—by adding it to chocolates. Potassium iodide should not be taken unless by the advice of a doctor for it is as harmful to have too much iodine as to have too little.

I might add that there is little chance of there being a shortage of sodium or potassium salts in the diet; those which are most likely to be lacking are salts of calcium, phosphorus and iron.

The following table shows where the most important mineral salts are found, and summarises their uses.

CHIEF ELEMENT.	CHIEF SOURCE.	USE.
Sodium.	Common salt.	Required for fluids of body. Regulates pressure.
Potassium.	Vegetables and fruits.	Required for cells of body. Regulates pressure.
Calcium.	Dairy products, eggs, green vegetables, nuts.	Necessary for all tissue, especially for bones.
Phosphorus.	Dairy products, eggs, liver, sweetbread, fish roe, wheat germ.	Helps to form nuclei of cells. Specially required by bones and nerves.
Iron.	Liver, eggs, meat, pulses, oatmeal, green vegetables, dried fruit.	Helps blood to carry oxygen.
Iodine.	Iodised salt, fish, seaweed, watercress.	Prevents goitre.

FATS.—Fat is a compound of glycerine with certain organic acids known in chemistry as the fatty acids; it contains the elements carbon, hydrogen and oxygen. Carbon and hydrogen

are constituents of coal and all other fuels, and it is the chemical action going on between these elements and the oxygen of the air which results in an output of heat ; a similar action goes on in the body, supplying the necessary heat and giving the energy required for life.

A food which can thus undergo combustion is known as an *energy* or *fuel food*, and fat belongs to this class ; but, just as one type of coal will give a greater supply of heat than another, so is it with the fuel foods. Fat is the most efficient of these and, weight for weight, supplies approximately twice as much heat and energy as do the other fuel foods ; it is for this reason that it forms such an important part of the diet in cold countries. The blubber and oil which would prove so nauseous to inhabitants of a milder climate are relished by the Eskimo, for they stoke the body fires and enable him to withstand the low temperature of his native regions ; in hot climates, on the other hand, very little fat is consumed. If more fat is taken than is required for immediate use, it may become stored as fatty tissue in the body and may form a protection for various organs, e.g. fat round the kidneys prevents these being affected by a sudden drop in temperature.

That fat is absolutely essential in the diet is shown by the fact that, if a person is deprived of it, he will before long develop a craving for it which will cause him to make desperate efforts to remedy the deficiency and he will eat things which in ordinary circumstances would be most repulsive to him. Fat is found chiefly in animal foods, viz. butter, cheese, egg yolk and oily fish. Animal fats contain certain vitamins which make them more valuable than the vegetable fats. Margarine is made largely from vegetable oils but it now has vitamins added to it to make up the deficiency. Its nutritive value is therefore equal to that of butter.

The fat known as *Lecithin*, which is present in the yolk of an egg, contains phosphorus, and this accordingly makes egg dishes beneficial to the nervous system.

As fat presents some difficulty to the digestive process, the amount consumed must be limited, but varies considerably according to the individual and to the conditions of climate, etc., in which he lives ; for a man living in this country about three ounces per day is generally regarded as satisfactory.

It is most necessary that a sufficient amount of carbohydrate should be taken with fat as its presence ensures that the fat is completely burned. Harmful substances known as *acetone* and *aceto-acetic acid* are produced by incomplete burning, and when these are present in the blood the condition *acidosis* occurs with its usual symptoms—headache, sickness and loss of appetite. Instinct has a wonderful way of keeping us in the right path with regard to proper food balance, and note how we supply carbohydrate with fat in such combinations as macaroni and cheese, fat bacon and beans, bread and butter, etc.

CARBOHYDRATES.—These contain the elements carbon, hydrogen and oxygen. The name would lead one to assume that they are associated in some way with water but actually they contain none ; there is, however, twice as much hydrogen present as oxygen and that is the proportion in which these elements occur in water. This fact distinguishes them from the fats, which contain the same elements in different proportions.

Carbohydrate is found chiefly in vegetable foods ; it is absent from those of animal origin with the exception of milk which contains a little in the form of a sugar called *lactose*, and liver which contains another carbohydrate called *glycogen*.

The most important use of carbohydrate is to act as a fuel food, giving a supply of heat and energy. As already mentioned, it helps to bring about the complete combustion of fat.

Carbohydrate is stored in the liver and passes into the blood stream according to the demand made by the body for heat and energy. An excess of carbohydrate may become changed into fat and be stored as such ; that is the reason for a reduction diet having necessarily a restriction of carbohydrate foods as well as of fat foods.

Carbohydrates may be divided into two groups—**starches** and **ugars.** The formation of starch is due to a chemical change rought about by nature which the scientist with all his elabor- te apparatus is unable to produce artificially. Plants absorb ater from the soil, while their leaves absorb carbon dioxide from he atmosphere and, during sunlight, these substances are hanged in the green parts of the plant into starch; this is ther converted into sugar and made use of as a food for the lant, or is stored as starch for future use. In the seed of the lant, e.g. in the cereals and pulses, a large store of starch is laid p to supply the seedling with food until it has developed green aves of its own and so is able to manufacture food for itself. Ve frustrate nature's plan every autumn, however, with our rm harvesting operations, and it is this store of starch which e make use of to form flour, oatmeal, etc. Think of a bag of veets, sealed in such a way that you cannot reach them with- ut first breaking the bag and you have an idea of the structure f the starch grain; the useful part of the grain, that which ourishes the body and which the chemist calls *granulose*, is osely sealed within a covering of a substance called *cellulose* which is not easily digested. If it remained sealed in this ashion the starch would be of as little use to us as the unopened ag of sweets, and the object of cooking starch is to burst the ellulose bag and allow the granulose to escape; this is done by upplying plenty of moisture and strong heat, and these are he factors which constitute the principle of cooking all starchy oods.

Some plants store their carbohydrate in the form of sugar nstead of starch, having manufactured it also from water and arbon dioxide; such plants are the sugar cane and the sugar eetroot and these are our chief sources of sugar.

In the form of starch, carbohydrate is present in flour, bread, atmeal, cornflour, rice, sago, tapioca, semolina, pulses, pota- oes, etc. In the form of sugar it is present in sugar, milk, oney, fruit and certain vegetables.

CHAPTER II

VITAMINS VERSUS DISEASE. BODY BUILDING, ENERGY AND PROTECTIVE FOODS

> "Natural foods such as milk must contain, besides the known principle ingredients, small quantities of unknown substance essential to life."
>
> LUNIN 1881

VITAMINS

THE beginning of the present century is a red letter period in the history of dietetics, marked as it has been by the discovery of these wonderful substances known as Vitamins which, though so minute in quantity that it is difficult to isolate them, have, nevertheless, a very important bearing on health.

Many times in the story of science great discoveries have cast their shadows before and suggestions have been made of facts long before they were actually proved and accepted; so was it with the vitamins. Though our knowledge of these may be said to date from the beginning of this century, the words quoted at the top of the chapter show that the existence of such substances had been suspected as far back as 1881. The words were written by a Swiss investigator who, in the course of his experimenting, had fed mice with a sort of synthetic food made up of the carbohydrate, protein, fat, mineral salts and water which were known to be present in milk; the substances were, beforehand, mixed in the same proportions in which they occur in milk but they were thoroughly purified before mixing. The mice fed on this diet soon showed signs of ill-health, their condition rapidly became worse and they died; when fed on ordinary milk they grew and

rived in a normal way. The suggestion, however, expressed the quotation was not accepted and the vitamins had to lie ndiscovered a little longer.

About ten years later some attention was directed to what we ow call the "Deficiency Diseases", i.e., diseases which are used by some deficiency in the diet.

At that time the disease beri-beri was very common in China nd other countries where rice forms a great part of the diet. It as discovered that this was due to the rice being eaten in the polished" form, the outside husk and the germ of the grain aving been removed during the polishing process; when the hole grain was substituted for this no ill effects were produced.

Scurvy was a disease which had for long caused much trouble mong sailors who had to go on long voyages without the present ay facilities for obtaining fresh food. The discovery was now ade that this disease could be produced in animals by depriv-g them of certain foods, although the food substances then nown to be essential, **viz.** proteins, etc., were fully represented their diet.

It was in 1906 that the research workers in this country began o awake to these facts. An Englishman named Hopkins, aving performed experiments similar to those of the Swiss nvestigator, concluded that life could not be maintained by the ood substances in a purified state, but that they must be con-umed as natural foods. He therefore suggested, as his pre-ecessor had done, that there must be some undiscovered sub-tances in these foods and that they were essential to life. The heory now aroused interest, and from that time a thorough in-estigation of the subject has been carried out and has resulted the establishment of what we now know as the **vitamins.**

These substances might be compared to the branch managers f a big business concern, who direct the work in each branch nd see that it is carried out in the right way; the vitamins xercise their function by compelling the other constituents f food to carry out their work properly, thereby ensuring

the smooth running and efficiency of every part of the body.

A newly discovered chemical substance is very often named from its composition but as little was known about this the vitamins were first distinguished by the letters of the alphabet; other names, however, have now been given to those which have been successfully isolated. The number is gradually growing and we now have vitamins A, B_1, B_2, C, D, E and K; others are under course of investigation. A, D and E are fat soluble and B_1, B_2 and C are water soluble.

If any of these vitamins is absent from the diet, or present only in small measure, the deficiency diseases mentioned above are developed. If, however, the shortage is not excessive general ill-health without the actual symptoms of disease will be the result.

Vitamins A and D are commonly found in the same foods, so for convenience we will consider them together. Vitamin A has three functions, viz. (1) it helps in the growth of tissue and so is of great value to children; (2) it prevents a painful eye disease and a condition known as "night blindness" where a person cannot see in a dim light; (3) it increases the resisting power of the body against disease germs, especially those affecting the respiratory organs. It will thus be seen that it is advisable to be well fortified with vitamin A during the season when bronchitis, influenza, etc., are prevalent.

The substance known as **carotene** which is present in the coloured matter of many foods becomes changed in the body into vitamin A* and any excess of this is stored in the liver and in bone marrow; carotene is therefore known as the *precursor* of vitamin A and carrots and some green vegetables are rich in it. In this connection a story is told of a young girl who had got into such a weak state of health that her parents began to despair of her recovery. The doctor when visiting her one day advised that she should be given some claret, and the anxious mother, whose hearing was not of the best, at once

* It is now believed that the carotene is not completely absorbed and so does not all form vitamin A.

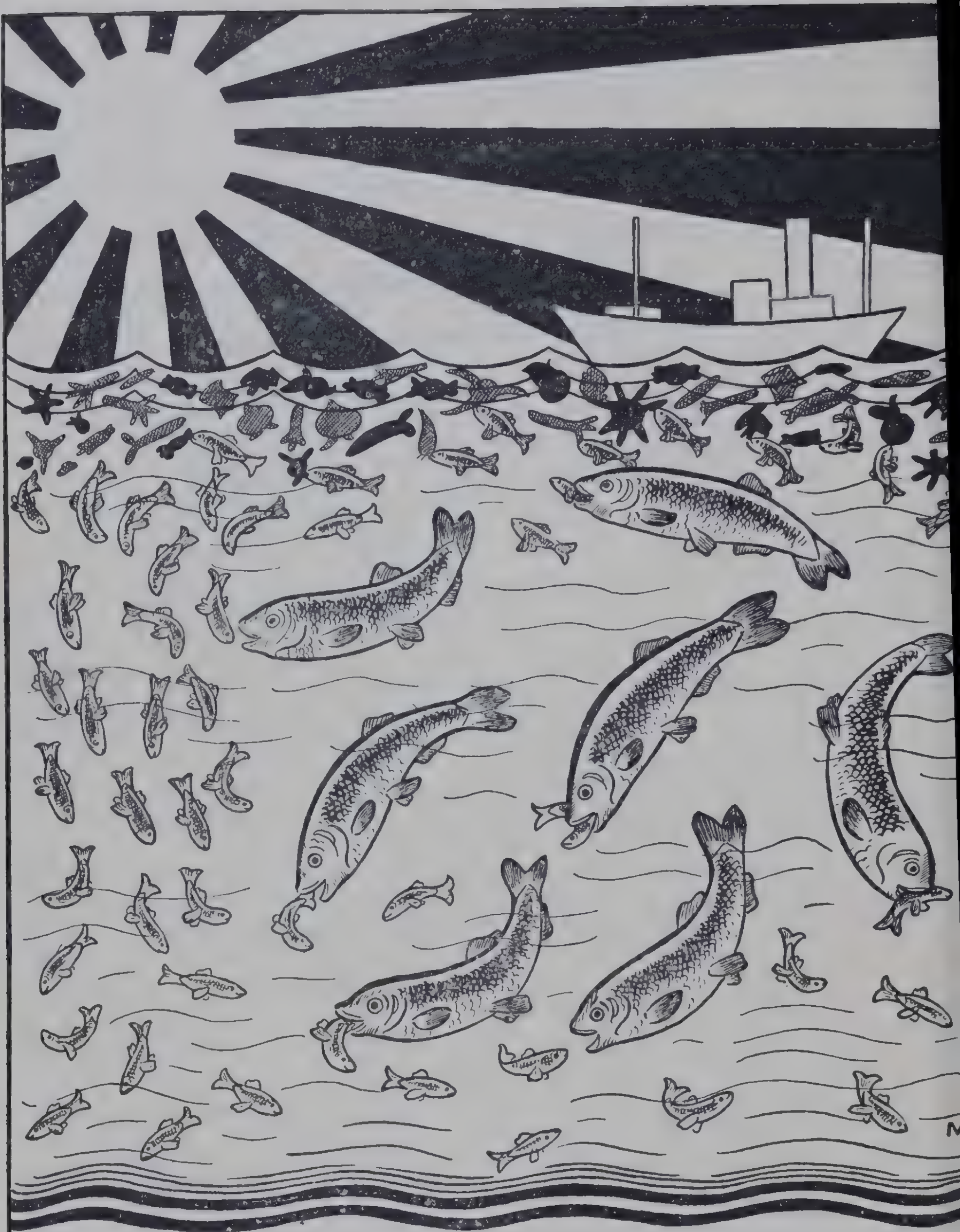
egan to supply the patient with as much carrot as she would ke; the result was that the girl began to show signs of covery and soon regained her health. I cannot vouch for the ıthenticity of that particular cure but certainly the health-ving properties of carrot—attributable no doubt to the tamin content—have been definitely proved.

From the vegetable source we get the vitamin transferred to rtain animal foods. In cases where cows are fed during the inter on grass which—dried by a special process—retains all s colour, the butter made from their milk is found to be cher in vitamin A content than butter made from the milk of ɔws fed on hay; it is thus assumed that the vitamin or rather its recursor originally comes from the green food which the animal ıts. In this connection the important part played by sunlight formation of colouring matter in plants is shown by the pale-ess of the stem and leaves of a plant grown in the dark; it is most entirely devoid of the substance required for the for-ation of vitamin. The outside leaves of cabbage and lettuce re a better source of carotene than the pale leaves in the centre hich the light does not reach.

The foods richest in vitamin A or carotene are: green vege-ıbles, carrots, tomatoes, dairy products, liver, salmon, herrings, ıd the various fish-oil preparations such as haliver oil and cod-ver oil.

Vitamin D or **calciferol** like vitamin A is important in a ıild's diet as it prevents rickets, a disease which occurs ıostly among poor children; a deficiency of it may cause, in ı adult, a somewhat similar condition called osteomalacia. 'e have already learned the necessity of supplying the bone-ɔrming salts, but the presence of these is no use unless they re deposited in the right place, and vitamin D seems to ɔok after this. It is found in salmon, herrings, the oil of the alibut and cod, liver, and a little of it is present in dairy roducts.

The high vitamin value of fish oil is accounted for by the fact



Sun strikes on coloured plankton. Small fish feed on plankton and so get vitamin. Large fish eat small fish and the vitamin obtained is stored in the oil of their bodies.

that the sun's rays strike down on the *plankton* or minute coloured organisms floating on the surface of the sea. Little fish feed on this plankton and obtain vitamin from it; large fish eat the small fish and so they in turn get a rich supply of vitamin which they store in the oil of their bodies. Cod liver oil may be introduced into fish sauces, savouries and other dishes without the taste being noticeable and adds much to their vitamin value.

Vitamins A and D can be obtained in a very concentrated form as the result of adding an alkali to fish oil. The greater part of the oil combines with the alkali to form soap, but there is always a minute fraction which will not be saponified and can thus be separated; it is this part which contains the vitamin and about four drops of it are equivalent in vitamin value to about a teaspoonful of cod-liver oil.

The advertiser has found that the word *vitamin* in an announcement acts as a powerful "draw", and so he makes claim for high vitamin value in his advertised foods. The recently passed Act of Parliament which requires that quantities of specially named constituents must be given will prevent extravagant vitamin value from being made.

Exposure to ultra-violet rays produces vitamin D in foods which contain a precursor of the vitamin, viz. either *ergosterol* or allied substances. Unfortunately such treatment may make the food unpalatable but milk can be successfully irradiated. The beneficial effect of sunlight on health is due to a similar process; the precursor is present in the skin and vitamin D is formed when the skin is exposed to the sun's rays. Since water reflects the ultra-violet rays the holiday-maker at the seaside may be supplied with an extra amount of vitamin D; snow reflects the rays to a still greater extent and this may partly account for the invigorating effect of winter sports. Ergosterol is present in yeast and from this concentrates of vitamin D are prepared and are sold as tonics under a variety of names. It is not advisable to take these unless

by medical advice as an excess of vitamin D may have har ful effects.

Vitamin B_1 can be separated from yeast and has been given t name " aneurin ". It is chiefly concerned with the toning up the nervous system and if very deficient the disease called beri-be is developed. The chief symptoms of this disease are paralysis the limbs and a sub-normal rate of heart beat which may resu in heart failure. It is not common in a country such as ou but occurs in places where the diet is more restricted. We i Britain, however, are liable to suffer from a less serious def ciency of the vitamin resulting in nervous weakness of som kind, loss of appetite, constipation and general loss of vitality

Vitamin B_2 complex.—This is now known to be made u of several factors. The most important ones are riboflavin whic promotes growth, nicotinic acid which prevents a disease calle pellagra, and adermin which has long been known to be essentia to the rat and has recently been proved to be required also by man. Pellagra gives rise to a peculiar skin eruption and a inflammatory condition of the alimentary tract. It is a serious disease but in this country it is almost unknown, though milder forms of ill-health may occur as a result of less acute deficiency of the vitamin. The function of vitamin H or Biotin is also concerned with the skin.

Vitamin B_1 is present in yeast, marmite, germ of cereals, brown bread, pulses and liver. The best sources of vitamin B_2 are yeast, marmite, germ of cereals, brown bread, liver, lean meat, egg, milk.

Owing to the presence of certain bacteria in the intestine vitamins of the B group may be synthesised in the body.

Vitamin C has now been found to be the crystalline substance ascorbic acid ; a deficiency of it produces loss of energy and a general *under-par* feeling. To it also has been attributed the power of preserving the characteristics of youth ; it certainly helps to keep the blood vessels in a healthy condition, a factor of much importance in promoting longevity. An extreme

deficiency of the vitamin causes scurvy; this disease does not occur in this country unless under conditions of great food shortage such as in war time.

Green walnuts and black currants have a very high vitamin C value. Strawberries, lemons, oranges and tomatoes are good sources, but all fresh fruits have a little. Green vegetables contain it, especially brussels sprouts, cress and parsley, but root vegetables are generally not such a good source. Wild fruits and vegetables have a greater amount of vitamin C than cultivated ones, e.g. the fresh leaves of the dandelion which may be used as a salad. Hips and haws are a particularly rich source and a preparation of these is now used as an anti-scorbutic where fresh fruit is scarce.

Another factor—vitamin P—which is closely associated with vitamin C is at present being investigated; it probably prevents fragility of the blood vessels.

Vitamin E is concerned with reproduction. It is present in wheat germ and green vegetables.

Vitamin K has something to do with the clotting of blood. A diet containing vitamins A, C and D will have enough of this vitamin.

Factors affecting stability of vitamins.—Vitamins A, D and E are not soluble in water and so are not lost in the cooking water; vitamins B_1, B_2 and C are soluble and so are lost if the cooking water is discarded. Vegetables contain an enzyme which destroys vitamins if kept long after being cut up or bruised. Oxidation may cause destruction of vitamins and this is accelerated by rise of temperature. Vitamin A can usually withstand the temperatures used in cooking, canning and drying without being much affected. Vitamin C is easily destroyed by oxidation and there may be loss of it during cooking (especially over-cooking and reheating), long storage of food, etc. It is therefore advisable to take some uncooked fruit or salad each day. In modern methods of canning the oxygen is removed from the surface of the food when the temperature is raised and

this helps to preserve the vitamin. Vitamin B_1, though sen[illegible] tive to heat, is not affected to any appreciable extent [illegible] ordinary methods of cooking. Vitamins B_1 and C are most stal[illegible] in the presence of acid and may to some extent be destroy[illegible] by alkaline substances such as soda. The significance of th[illegible] however, is not so great as it was once thought to be. Vitami[illegible] B_2 and D are very stable to the above factors but the latter [illegible] destroyed by over-exposure to sunlight or the ultra-violet ray[illegible]

Although we hear so much about vitamins nowadays w[illegible] must not imagine that by taking unlimited doses of them w[illegible] will get a corresponding measure of health; like most goo[illegible] things we can get too much of them, and an overdose of vitami[illegible] may induce a diseased condition of the body. It is definitel[illegible] known that an excess of vitamin D is harmful.

Vitamin Units.*—The International units adopted for thos[illegible] vitamins which have been isolated are as follows:

Vitamin A—One unit is the vitamin A activity of 0·6 micro[illegible] gram of pure β-carotene.†

The International Standard Preparation is issued in the form[illegible] of a standard solution in oil, the strength of the solution bein[illegible] such that 1 gramme contains 500 International Units, or 30[illegible] micrograms of β-carotene.

Vitamin B_1—The unit is the potency of 3 micrograms of [illegible] standard preparation of aneurin.

Vitamin C—Here the unit adopted is the vitamin C activity of 0·05 milligramme of l-ascorbic acid. (This is approximately equivalent to 0·1 c.c. of freshly prepared lemon juice.)

Vitamin D—The unit in this case is the vitamin D activity of 1 milligramme of an international standard solution of irradiated ergosterol, which is equal to 0·025 micrograms of crystalline vitamin D.

* Taken from the *Bulletin of the Health Organisation of the League of Nations*, vol. III, No. 3.

† There are three forms of carotene and each can produce vitamin A, but different amounts of it.

The amounts of vitamin B_1, riboflavin, nicotinic acid and vitamin C in a food are now usually stated in milligrams.

Tables can now be got which show the vitamin content of most foods in terms of these units; there are many factors influencing the amount of vitamin present and different samples of the same food may show quite a wide variation in their vitamin content.

The daily requirements for an adult are:

3500 to 5000	International Units of vitamin A		
1 to 2	m.gms of vitamin B_1		(Amount depends on Calorie output)
$1\frac{1}{2}$ to 3	,, ,,	riboflavin	
10 to 20	,, ,,	nicotinic acid	
50 to 75	,, ,,	vitamin C	
400	International Units of vitamin D		(Amount depends on available sunlight and other factors)

The vitamin needs of children and nursing mothers are higher than those of adults.

WATER

Water is a substance of much importance in the diet; its value is often overlooked, probably because it can be got so easily, and yet it is even more necessary to life than food itself. One can exist for several weeks without food but only for a day or two without water. Every tissue contains it and nearly three quarters of the weight of the body is due to it, so a person weighing ten stones would be reduced to two and a half stones if we could imagine all the water being drawn off from the tissues. It is the great purifying agent in the body; like the drainage system of a house, it gathers up much of the harmful waste matter and carries it away to the excretory organs.

We can thus appreciate the important part that water plays in safeguarding health and the need for replacing what is lost

daily by the skin, lungs and kidneys ; this amount is about fo pints per day. Practically all foods, no matter how dry the may look, contain a certain amount of water and we can deper

SECTION OF VEGETABLE.

Note.—Starch grains and framework of cellulose which forms roughage.

on getting about a third of the four pints from solid food ; th rest should be taken as beverages and as pure water. Many people who never drink water would find an improvement in their health if they did so.

ROUGHAGE

A substance which has no nutritive property in itself but which must not be omitted from the diet seems something of a contradiction ; this, however, is the description accurately applied to roughage, a name of American origin which we give to that part of food which cannot be digested into a form that will enter the blood. Its nutritive value is nil, but it must not be left out of the diet for it helps to stimulate contraction of the muscles in the intestinal wall and so prevents constipation, the cause of so much trouble in these days of over-refined foods

The best foods for supplying roughage are—fruits, vegetables, nuts, oatmeal and brown bread.

SUMMARY OF FOOD CONSTITUENTS

FOOD SUBSTANCE.	USES.	FOODS PARTICULARLY RICH IN IT.
Protein.	(1) Builds and repairs tissue. (2) Can give heat and energy.	Meat, eggs, fish, milk, pulses, nuts.
Fat.	(1) Gives heat and energy. (2) Forms reserve fat	Milk, butter, oily fish, fat meat, salad oils, nuts.
Carbohydrate.	(1) Gives heat and energy. (2) Helps to burn fat.	Cereal products, pulses, potatoes, sugar and sweets, milk.
Mineral Matter.	May (1) help to form bone and other tissues; (2) help to form the digestive secretions; (3) regulate osmotic pressure; (4) be required for blood and glands.	Vegetables, fruits, milk, eggs, liver, oatmeal, etc.
Vitamin A.	(1) Prevents eye disease. (2) Promotes growth. (3) Increases resistance to disease.	Dairy products, green vegetables, carrots, tomatoes, salmon (tinned or fresh), herrings, fish oils, liver.
Vitamin B_1	(1) Strengthens nervous system. (2) Prevents constipation. (3) Prevents the disease Beri-Beri.	Yeast, national bread, germ of cereals, marmite, pulses, liver.

FOOD SUBSTANCE.	USES.	FOODS PARTICULA- LY RICH IN IT.
Vitamin B_2 complex.	(1) Promotes growth. (2) Prevents Pellagra and skin disease.	Yeast, national bre marmite, bemax, liv lean meat, egg.
Vitamin C.	Prevents scurvy.	Fruit and vegetab undried or germina pulses, salads.
Vitamin D.	Strengthens bone and prevents rickets.	Salmon (tinned fresh), herrings a fish oils, liver.
Vitamin E.	Necessary for reproduction and lactation.	Meat, eggs, green ve tables, seeds of plar
Water.	(1) Forms tissue. (2) Helps in absorption of food and carries it to all parts of body. (3) Carries away waste matter.	Water and other bev ages. Present in foods except sugar.
Roughage.	Helps in elimination of waste matter.	Brown bread, oatme fruit and vegetables.

CLASSIFICATION OF FOODS

From the foregoing pages it will be understood that t function a particular food will perform in the body w depend on which food substances are present and so foo are classified according to the predominating substance follows :

I. **BODY BUILDING FOODS** (rich in protein).

(*a*) First class—milk, eggs, cheese, meat, fish.

(*b*) Second class—pulses, nuts, cereals.

II. FUEL or ENERGY FOODS.

(*a*) Cereals, pulses, sugar, etc. (rich in carbohydrate).
(*b*) Butter, cream, suet, etc. (rich in fat).

III. PROTECTIVE FOODS. (contain vitamins and mineral salts which are absolutely essential for health).

(*a*) Milk, butter, cheese, eggs, liver, salmon, herring.
(*b*) Wholemeal bread, vegetables, fruit.

FACTORS INFLUENCING AMOUNT AND KIND OF FOOD REQUIRED

The amount and the kind of food required by the individual depend on various factors. Children, of course, need less than adults but proportionately they actually require more in relation to the size of their bodies. The nature of the work performed also has an important bearing on the amount of food required ; when a person is lying in bed his needs are only about half of what they are when he is up and doing moderate work ; the more strenuous the work the greater is the demand for food.

The food requirements also depend greatly on the climate and season ; there must always be a balance between the heat produced in the body and that given out, so that a steady normal temperature will be maintained. The loss of heat is largely controlled by the temperature of the surrounding air and so the diet should be adjusted to suit the changing seasons. With the chill of autumn and winter comes a greater loss of heat and a call for more fuel to keep the body fires burning briskly. Fat is the most efficient fuel food, it will be remembered, and so suet puddings and fat rich foods of all kinds should then find a prominent place in the diet ; these will help to ward off the chilblains, colds, etc., which winter brings in its train. Christmas and the Christmas dinner bring plum puddings and mince pies, both admirably suited to mid-winter weather conditions.

The festivities and pleasant social intercourse of Christmas and New Year seem to have an appreciable effect on digestion and enable people to enjoy a very liberal amount of the rich foods and the many kinds of sweets then offered; elderly people, however, are wise to be wary of over-indulgence in such things at this season.

During the summer we are able to reap the benefit of the sunshine both by being out in the open more often and also, indirectly, from the variety of sun-ripened fruit and green vegetables then available; the vitamins thus obtained give us a supply of vitality which usually carries us through the autumn and part of the winter. As winter advances it is increasingly difficult to obtain these vitamin foods and they become more expensive, this being the more regrettable because it is during these days that we really have most need of them. It may therefore be regarded that, so far as health is concerned, the winter really commences in January or February; it is then that we usually begin to feel the want of vitality, and all sorts of illnesses become prevalent owing to the body having less power to resist disease germs. It is wise at this time to ensure a supply of vitamin foods in the diet by making the most of winter vegetables, e.g. savoys, celery, etc., and of any fresh fruits which are obtainable; tomatoes are always a stand-by and can usually be got at a moderate price all the year round. As spring comes along, we are able once more to replenish our much depleted vitamin stores from the fresh vegetables of all descriptions which are then to be had.

With the advent of warmer days, it is advisable to replace the heavy, fat-rich items in the diet by lighter and less heat-giving ones; the dessert should ring the changes between such things as jellies, fruits, ices, custards, etc., and fruit drinks of all kinds are excellent at this time.

CHAPTER III

SOME COMMON FOODS AND THE PART THEY PLAY IN NUTRITION

"The fundamental problem of health is the wise and scientific nurture of the body."

Sir George Newman

n the last two chapters we have learned something about the onstituents of food; we now know that each of these subtances has a particular function to perform in maintaining the ealth of the body, and so we can appreciate the fact that if any ne of them is absent from the diet the result will be disastrous s far as health is concerned. It is therefore obvious that in rder to be able to plan a diet correctly, it is necessary to know vhere each particular substance is to be found, and this leads us o a study of the composition of individual foods.

ANIMAL FOODS

Milk.—Many people look on milk as being merely a beverage nd do not realise that it is one of the best foods that can be ought. When we consider a food from a nutritive point of iew we often find, that though it may be very good in one espect it is unsatisfactory in another, but milk is valuable no natter from what standpoint it is considered. The only fault vhich might be found with it is that it is rather deficient in iron alts, but this shortcoming is largely mitigated by the fact that he iron salts it contains are present in a form that allows of very asy assimilation.

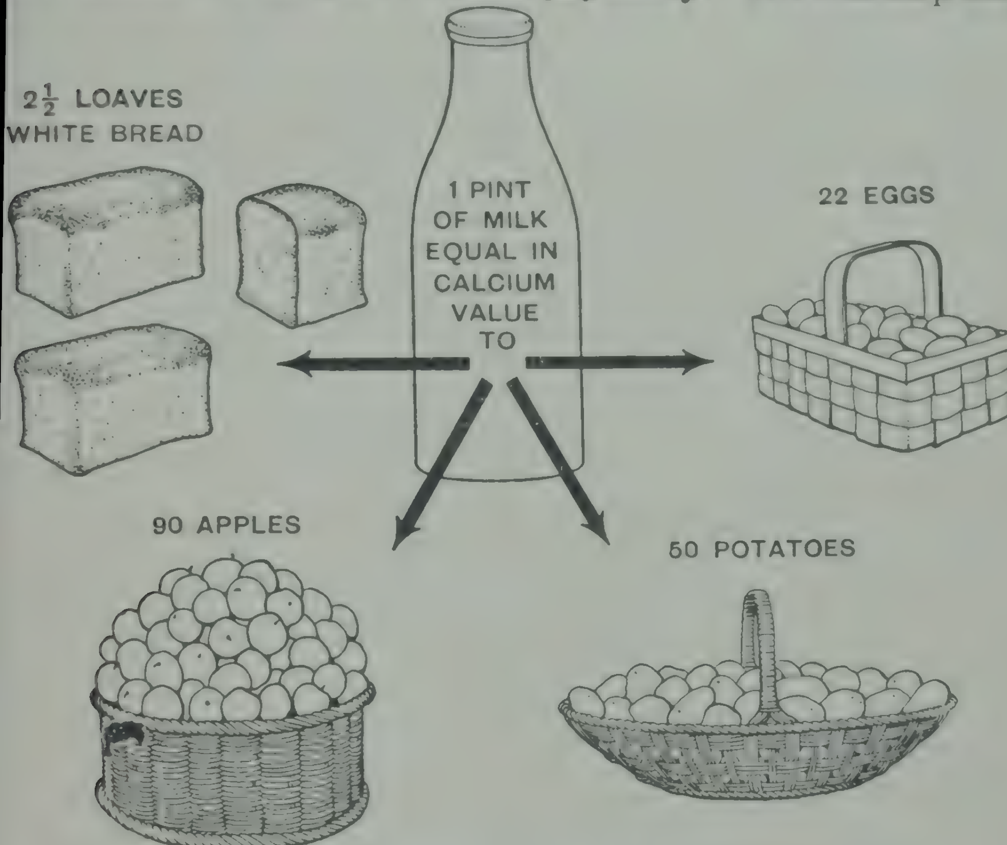
Milk is the only food which contains all the food substances; in addition, it contains them in a very easily digested form and so there is little waste. It is the only food of animal origin which contains the alkaline mineral salts so necessary to healthy blood. It also contains some of all the vitamins and is a very good source of vitamin A. Thus, the drinking of plenty of milk during an influenza epidemic is helpful in warding off infection.

The great value of milk to the growing child has been proved beyond all doubt by the many experiments which have been carried out, groups of children in the schools being given an extra quantity of milk each day and after a time compared with groups that had got no milk. In all cases it was found that the children who had got the extra ration of milk had increased in height and weight to a greater extent than those who had got none; they were also noted to be more lively, alert and vigorous. In one instance unexpected corroboration of this fact was submitted to a teacher by a little girl who, having taken a special interest in the experiment, confided one day that she knew the milk *must* be doing her good as she could fight her brother now! Whilst adults might with advantage drink more of it, milk is of special importance for children, and a child should get at least a pint per day—more if possible; there are a great many children who are not getting anything like this amount.

Milk is regarded by some people as a dear food, but more value is to be got from a shilling's worth of milk than from a shilling's worth of most other foods, and it is not really dear when we consider its nutritive qualities. It contains the best kind of protein that can be got, it is almost completely absorbed, it helps the body to resist disease, and one pint gives as much calcium as two and a half loaves of white bread, ninety apples, fifty potatoes or twenty-two eggs.

In October 1934 an important step was taken by the Board of Agriculture, a scheme being introduced by which any child in

he elementary schools can get a third of a pint of milk for the um of one halfpenny; it is granted free in necessitous cases. Without doubt this is having a beneficial effect on the health of he rising generation and should help to banish the reputation we ave earned of being a C3 nation physically. The consumption



HIGH CALCIUM VALUE OF MILK.

of milk in this country before the *milk-in-the-schools* scheme was inaugurated was only a little over one gill per head of the population per day, and in this lies perhaps more than a little of the blame for the C3 stigma.

Milk is so easily adulterated that it requires more careful inspection than any other food; in addition, germs grow and multiply in it more readily than they do in other foods, so it is most important that the supply should be as clean as possible.

There are, however, friends as well as foes among these bacteria; some are quite welcome as they have a restraining effect on the growth of undesirable ones and some are of use in making butter and cheese. But the great danger of the spread of disease makes it necessary for us to try to keep the number of bacteria in milk as low as possible. Many types of infection can be spread by it, one of the worst of these being tuberculosis and a good number of the inmates of sanitoria have contracted the disease by drinking milk which has come from a cow suffering from tuberculosis, a disease to which cattle are very susceptible.

The Milk and Dairies Act, passed in 1923 through the instrumentality of the Public Health Department, has done a great deal to improve the nation's milk by compelling and encouraging the farmer to offer to the public a cleaner supply. Under this Act all those who sell milk have to be registered, and if they do not comply with the regulations their licence to sell it may be withdrawn.

The Milk and Dairies Act also provides laws for the grading of milk; and different designations for the grades are used in England from those used in Scotland. In the English scheme there are four grades of milk, namely, Tuberculin Tested, Accredited, Tuberculin Tested (Pasteurised), and Pasteurised.

Tuberculin Tested Milk.—To get their milk sold under the designation "Tuberculin Tested" and so secure a higher price, the farmers have to comply with the following regulations: The cows have to be tested for tuberculosis by what is called the tuberculin test at intervals of not less than two and not more than six months. No animal may be added to the herd unless it has passed this test; if any animal is found to react to the test it must at once be removed from the herd. The cows have also to be generally examined by a veterinary surgeon at intervals of not more than six months and if any animal is found to be suffering from a disease which may injuriously affect the milk it

must at once be removed, or isolated till it has recovered. The herd must be isolated from all other cattle. The cowsheds and premises at the farm must be clean and well ventilated, and the milk must be sent from the farm in sealed bottles or in suitable containers holding at least two gallons; these must be labelled *Tuberculin Tested Milk* and have the address of the dairy, the date of production, and the words *morning* or *evening* according to the time of milking; if it is bottled at the farm the word *Certified* is added. The bacterial content of the milk is now tested with Methylene Blue—bacteria have the effect of decolorising that substance. A sample taken at any date from 1st May to 31st October in any year is regarded as being satisfactory if it fails to decolorise the Methylene Blue in 4½ hours, while a sample taken from 1st November to 30th April is satisfactory if it fails to decolorise the Blue in 5½ hours. The milk must show no coliform bacillus in one-hundredth of a cubic centimetre, the presence of this type of bacillus indicating contamination by manure.

Accredited Milk.—Under this grade every cow must be generally examined by a veterinary surgeon every three months and if it shows signs of any disease which may affect the milk it must be isolated or removed permanently from the herd; the tuberculin test, however, does not require to be carried out. The herd must be kept separate from other milk cows. The milk must satisfy a Methylene Blue test for bacteria and show no coliform bacillus in one-hundredth of a cubic centimetre. The regulations for the sealing and labelling of the containers are similar to those for Tuberculin Tested milk.

Pasteurised and Heat Treated Milk.—Here the milk is heated for a certain time, the length of time depending on the temperature but the temperature must never be higher than 173° F. The milk must comply with the standard in certain bacteriological tests.

Tuberculin Tested (Pasteurised) Milk.—This type of milk must be obtained from an establishment which has been

granted a licence for Tuberculin Tested Milk. It must be sent to the consumer in bottles or containers which have been sealed at the place of pasteurising and must be labelled *Tuberculin Tested (Pasteurised) Milk.* The milk must comply with the standard in bacteriological tests.

In the Scottish scheme of grading the highest grade is **Certified Milk.** The regulations with regard to the production of this are similar to those of the Tuberculin Tested milk of the English scheme but the milk has to be bottled at the farm, the bottles being sealed and labelled with the name of the producer, the date of production (including the words *morning* or *evening*), and the words *Certified Milk.* If tested at any time before it reaches the consumer it must not be found to contain more than 30,000 bacteria per cubic centimetre and no coliform bacillus in one tenth of a cubic centimetre.

The second grade is **Tuberculin Tested** milk and the regulations with regard to it are very similar to those for Certified Milk but the milk may be sent away from the farm in large containers, which must be sealed and labelled. This milk must not have more than 200,000 bacteria per cubic centimetre and no coliform bacillus in one hundredth of a cubic centimetre. (Note, the smaller the quantity examined the less chance is there of the bacillus being present, hence the less severe the test.) The milk of this grade may also be pasteurised and is then sold under the designation " Tuberculin Tested (Pasteurised) Milk "; the bacterial test has then to satisfy similar requirements to those for Certified Milk.

The third grade is **Standard Milk** and it corresponds very closely to the " Accredited milk " of the English scheme.

The fourth grade, **Pasteurised and Heat Treated Milk,** is also similar to the English grading, and the results of bacteriological tests must be satisfactory. This treatment destroys tubercular and other harmful germs.

By purchasing graded milk one is assured of getting, not only a cleaner milk, but also one of high nutritive value, the

legal standard for fat being higher than that for ungraded milk.

Preservation of Milk.—Milk being such a perishable food, special means of preservation have been devised; those in common use are the processes of desiccation and condensing. There are two methods of drying milk. In one the milk is sent in a fine spray into a room containing heated air and a rapid evaporation of the moisture takes place; the milk falls to the floor as a fine powder which, being drier, is not attacked so readily by bacteria. The powder is redissolved when water is added to it. In the other method the milk is passed between heated rollers, which produce the same effect as the warm air. During the drying process vitamins B_1 and C are lost but even fresh milk does not have much of these. Dried skimmed milk also lacks vitamins A and D and is not suitable for infant feeding.

There are three classes of condensed milk—unsweetened whole milk, unsweetened skim milk, and sweetened whole milk. They are produced by heating the milk under reduced pressure so that a large part of the water is driven off, care being taken to ensure that the temperature is not high enough to affect the remaining constituents to any degree. When the unsweetened types are diluted according to the directions on the tins a substance very similar to the original milk is produced; the sweetened type, however, containing as it does a large quantity of cane sugar, has to be diluted to such an extent because of its sweetness that its composition does not at all resemble that of milk.

One advantage possessed by condensed milk is that it is free from germs; it is probable also that, owing to the absence of oxygen during the condensing process, the vitamins are not much affected—with the exception of vitamin C which, as we have learned, is most easily destroyed.

Cream.—Cream consists chiefly of the fat of milk, along with a quantity of water. The proportion of fat varies according to the method adopted for removing the cream from the milk; if

it is removed by hand skimming there is about 20% of fat, bu if a centrifuge is used the separation is much more complete, an there is from 40% to 50% of fat in the cream. Devonshire c clotted cream is prepared by previously warming the milk, thu causing a very complete separation, and the fat then amounts t about 60%. Cream is easily digested, for the fat it contains i present in an emulsified form—that is, it is divided into ver minute globules which remain in suspension in the liquid.

Cheese.—Cheese acquires much of the value of the milk from which it is made. Its composition varies considerably, accord ing to type; for example, some cheeses contain more wate than others, and the amount of fat depends on the kind o milk used. All varieties of cheese are very rich in protein so all form a good and cheap substitute for meat. The price is usually based on the flavour rather than on the food value, but for economy and food-value combined there is probably no better cheese than Cheddar.

It is the fat in cheese which makes it rather an indigestible food; cheese is sometimes thought to be unsuitable for young children but if it is grated and not given in too large amount a child of 12 months will usually have no difficulty in digesting it. Cheese is more digestible when served along with some carbohydrate such as macaroni, rice, etc; also, as I have explained earlier, the presence of carbohydrate ensures that the fat is completely burned.

Butter.—Butter is a particularly rich fuel food, consisting almost entirely of fat; of all fats it is the most easily made use of by the body, and even the weakest digestion can tolerate a moderate amount of it. It contains the important vitamins A and D which are present in milk. Margarine is made from vegetable oils and vitamins A and D are added to it to bring up its food value to that of butter.

Eggs.—Eggs are essentially of very high nutritive value, con- taining as they do all the substances necessary for the growth and development of the chick; these are present in an easily

digested form and it is this latter advantage which makes eggs such a valuable article of diet in the nursery and hospital. In the white and yolk there is a good supply of first-class protein. Fat is present only in the yolk, where it occurs in a finely divided emulsified form which is easily digested; lecithin with its beneficial effect on the nerves has already been mentioned. The needs of the developing chicken prove that eggs must also be an excellent source of bone-forming and blood-forming salts and of the vitamins which are so necessary to life in any form. Incidentally, eggs contain less calcium than milk but have more iron.

The colour of an egg has no bearing on its food value, though some people are deluded into believing that eggs with brown shells are the more nourishing; cases are known of brown eggs actually commanding a higher price than white eggs on account of this belief, an amusing illustration of how even a fallacy can be converted into a money-making proposition.

There are various kinds of dried eggs on the market and these are useful for cooking. Many custard powders, however, are composed merely of cornflour which has been treated with a yellow colouring matter, and their food value in no way resembles that of eggs.

Meat.—This is an important constituent of the diet, being one of the chief sources of tissue-forming protein. The juice of the meat, which consists of a solution of protein, mineral salts and substances known as extractives, is contained in minute tubes or fibres, joined together by a skin-like substance called connective tissue. Embedded in the latter lies some fat, so that which we commonly call lean meat is not really devoid of fat; apart from this, however, there may be a variable amount of fat attached to the meat, but this depends on the animal and on the cut. The extractives, so called because they can be dissolved out of the meat by water, have no real nutritive value but they have a certain use in the diet as they give the tastiness to meat and induce a flow of digestive juice.

The digestibility of meat depends on the length of the fibres and the manner in which they are connected together. Short fibres, loosely joined as we find them in mutton, are most easily digested; it is this that makes mutton preferable to beef in invalid diet. The indigestible nature of pork is chiefly due to its richness in fat.

Meat is rich in iron salts, but much of what is present in beef and mutton is not available (see page 7). Liver and kidney are good vitamin foods. They are very compact with little connective tissue; this makes them somewhat difficult to digest and they require to be thoroughly cooked. The iron and another active principle present in liver help to prevent anæmia. Unfortunately, since the beneficial properties of liver have become known, it has gone up very much in price; it can, however, still be purchased as cheaply as the medium cuts of meat. Heart is also quite nutritive and contains more fat than does liver or kidney. The brain of the animal is sometimes used as food, but it has been found not to be well absorbed.

Tripe contains a large amount of connective tissue and long cooking is necessary to convert this into gelatine and so render the tripe digestible; when properly cooked it is easily digested but has few extractives and it is improved by serving with something tasty such as onions.

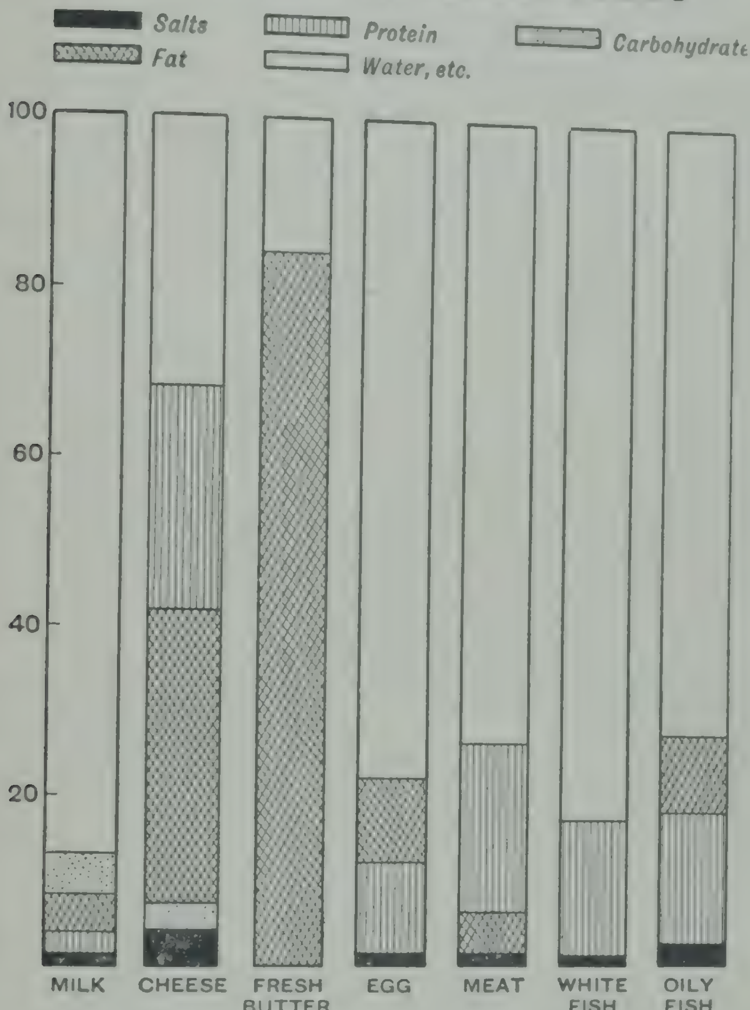
Sweetbreads form a popular invalid dish; there are two of these, the heart and the throat sweetbreads, both of them being glands. They are nourishing and easily digested, but as they contain a protein which readily produces uric acid they should be avoided in some cases of rheumatism and kidney weakness. Liver and other glandular organs should likewise be cut out of the diet of those suffering from these ailments.

Owing to the present-day demand for savoury things sausages are being largely used, but the nutritive value of these is doubtful. As a rule all the scraps of the butcher's shop are used up in

making them. At present soya bean takes the place of some of the meat.

A large quantity of frozen and chilled meat is used in this

COMPOSITION OF ANIMAL FOODS



country, over a million tons being imported each year, but this is dealt with in another chapter.

Fish.—While the amount of protein in fish is fairly constant, the different kinds of fish vary considerably in the amount of fat they contain, and this has led to their being divided into two

classes—**white fish and oily fish.** All kinds of fish require fat like other animals, and it is found that those in which fat is absent in the edible part contain a large amount of it in the liver; that of course is removed during the cleaning process but, as already stated, it is a valuable source of an oil rich in vitamins. The structure of fish is similar to that of meat, and the short loosely-connected fibres are easily masticated and digested.

The oily fish are less easily digested but more nourishing; the one which deserves special mention is the humble herring, because of its cheapness relative to the amount of nourishment contained in it. It is weight for weight as rich in protein and fat as some cuts of meat and, as mentioned earlier, is an excellent source of vitamins; a nicely-cooked herring costing 1½d. can very well take the place of meat costing 6d. or more. Salmon, both tinned and fresh, has a high vitamin value. Deep sea fish have the best flavour and can usually be distinguished from those which swim nearer the surface by the darkness of their skin.

Some people attribute to fish the property of being beneficial to the brain, but there is no scientific evidence to support such a theory. The fallacy of this idea is well expressed by the story of the medical student who, offering the above information at an oral examination, was cuttingly told by the examiner that he had better go and eat some fish!

Another class includes the **shell fish**, and the most nourishing of these are shrimps. Then come lobsters and crabs, which have just as much protein as the other types of fish but contain very little fat; they have the added disadvantage of being rather indigestible. Oysters are more easily digested but become less so, the longer they are cooked; they are not so nourishing as the other shell fish mentioned and are chiefly of value for their flavour.

It is most important that all shell fish should be fresh and properly cooked; some of them are foul feeders, and therein lies a danger of infection from pathogenic germs.

*AVERAGE COMPOSITION OF ANIMAL FOODS

	MILK Per cent.	CHEESE (Whole milk) Per cent.	BUTTER (Fresh) Per cent.
rotein	3	26	0
at	3 to 4	35	84
arbohydrate	4 to 5	3	0
ineral Matter	1	4	0
ater, etc.	the rest	the rest	the rest

	EGGS Per cent.	MEAT (Average) Per cent.	WHITE FISH Per cent.	OILY FISH Per cent.
rotein	11	20	16	16
at	10 to 12	5	0	9 to 18
arbohydrate	0	0	0	0
ineral Matter	1	1	1	2
ater, etc.	the rest	the rest	the rest	the rest

The relative proportions of these constituents may be more asily visualised from the diagram on page 37.

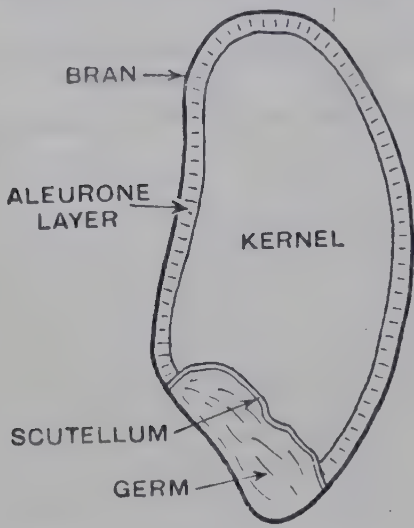
VEGETABLE FOODS

In those animal foods which we have studied it will have been oted that the predominating feature has been the abundance of rotein and fat and—with the exception of milk—the absence of arbohydrate. Now we turn to the vegetable group of foods, here carbohydrate is found to be the chief constituent, and here protein and fat are absent or are present only in relatively mall amounts.

The Cereals.—The most important of all vegetable foods are e cereals. In nearly every country in the world there is a articular cereal which forms the staple food of the people and this country it is **wheat**. A wheat grain has an outside covering or husk consisting of cellulose, mineral salts and a little

* Note.—The composition of a food varies a little with different samples d the figures given are average values.

starch. At one end lies the germ which forms the young plant
it is particularly rich in protein, fat and B vitamins. Th
greater part of the grain is composed of nutritive materi
laid up to nourish the plant until it has time to develop gree



Section of Wheat Grain.

leaves and be able to manufa
ture food for itself; this pa
is called the kernel. Round th
outside of the kernel and ju
under the husk lies the aleuro
layer; this layer is of speci
value as it contains a high
class of protein than the re
and also is rich in the B vit
mins. The scutellum whi
separates the germ from the re
of the grain is particularly ri
in these vitamins. This pa
and the other parts rich
vitamins were entirely remov
in the pre-war white flour.

Brown bread has much in its favour, being rich in th
B vitamins, iron and roughage. The national bread also co
tains these substances but the availability of the iron has n
yet been definitely determined. Calcium carbonate is add
to make up for the immobilising effect which the phytic ac
present has on calcium.

The chief product of **Oats** is oatmeal. It is richer in prote
and fat than white flour, contains more roughage and gives
supply of iron salts.

Cereals, especially oats, are sometimes blamed for having
harmful effect on teeth and bone formation. This is due
the presence of phytic acid which unites with calcium formi
an insoluble and so unavailable compound. They shou
therefore be taken with foods which contain vitamin D a
an available supply of calcium and phosphorus. Oatmeal

an excellent food for both old and young when combined with butter as in the case of oatcakes or with milk as in the case of porridge and there is nothing more delicious than well-made porridge with cream.

Meal Monday is still a recognised holiday in the Scottish universities, but I doubt if any of the students now carry out the time-honoured custom of returning from home with a bag of oatmeal ; this, in the olden days, was used to eke out the slender bill of fare in rented garrets or other lodgings. It is a pity that in more recent years the value of such things as oatmeal and herring has become so little known or so little heeded.

Rice is a cereal which is particularly rich in starch but it has very little protein. As in the case of wheat the vitamin in rice is in the germ and outer part of the kernel. Polished rice therefore does not contain vitamin, unpolished rice does contain it. **Cornflour** is in reality maize starch and contains no protein, fat or vitamin. **Tapioca, arrowroot** and **sago** are similar to cornflour in nutritive value ; they, however, are not produced from cereals, the first two being got from the underground part of certain West Indian plants and the third from the pith of the sago palm.

Garden Vegetables and Fruits.—We are now very familiar with the slogan " Eat more fruit " and might very well vary it by " Eat more vegetables." Both fruit and vegetables supply vitamins and their alkaline salts maintain a healthy alkaline balance in the blood. They are therefore a very essential part of the diet.

The value of vegetable substances was recognised long before vitamins were heard of and we read of wonderful cures having been effected in olden days by means of herbs ; for example, an old favourite for correcting a sluggish liver was the dandelion. The leaves of the dandelion are sometimes used for salads at the present day ; their vitamin content is high and they are rich in iron salts. In some parts of England a light beer, known as nettle beer, is still sold ; it is made from the stems and leaves of

fresh green nettles and is very good for the blood. The ver young shoots of the nettle may be used as a vegetable, lik spinach, but on account of the great amount of cystolithes– tiny crystals—present in them they are inclined to be gritty. great variety of dishes were made in the olden days from herbs some of these would probably not be very much relished to-day but they go to prove that the benefit to be derived from fresh vital, vegetable foods has for centuries been an ingrained part o human knowledge.

Vegetables may be conveniently classified into two groups (1) roots and tubers ; (2) green vegetables.

The **roots and tubers** like the cereals, are a reserve of foo material which has been laid up by the plant for future use Carrot, turnip and parsnip are succulent roots and the carbo hydrate in them is sugar. The potato is a tuber or enlarge underground stem ; it is one of the most important vegetables o this group as it is unusually rich in starch for this type of vegetable Its vitamin value is not high but owing to the large amoun consumed it is quite an appreciable source of vitamin C. Youn potatoes have more than old ones.

The second class—**green vegetables**—are of use chiefly fo their mineral salts and vitamins ; most of them have very littl of the other food substances. The leafy ones, such as cabbage are a better source of roughage than the root-and-tuber class and the outside green leaves have more calcium salts and vitamin than the paler leaves in the centre. Peas and bean are specially characterised by their richness in protein an carbohydrate.

Turning to **fruits**, those of the citrus variety are good they have a very cleansing effect on the system and when on is suffering from a severe cold a lemon drink has most beneficia results ; if the throat is sore, painting with lemon juice wi sometimes relieve the condition. Blackcurrants are particularl rich in vitamin C. Apples have not a high vitamin value bu they are good for the teeth, not only because of the masticatio

they require, but because they create a full supply of saliva—nature's mouth wash—which is effective in removing the acids that destroy the enamel of the teeth. Here is a little experiment for students and others who have the facilities to try it: test your saliva with litmus paper (this is a test paper to tell whether a thing is acid or alkaline); it will probably be found to be slightly alkaline. Eat a piece of apple or other fruit and immediately after you have swallowed it test again; you will find that the saliva has become more alkaline and you have already learned that alkaline substances destroy acids.

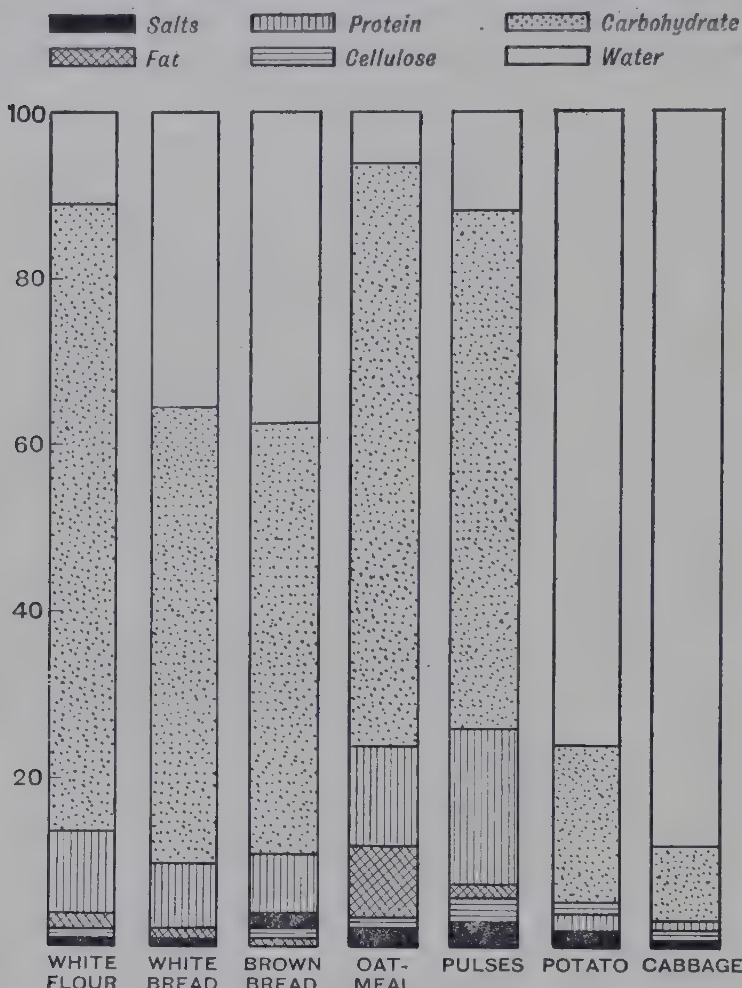
Concerning the digestibility of fruit it is sometimes said that it is *golden* in the morning and *leaden* at night, but if it is well chewed there is no reason why it should be indigestible at any time.

Pulses.—These include peas, beans and lentils. The fresh pulses have already been referred to but the dried varieties form an important class of foods; besides being rich in starch they differ from most other vegetable foods in having as much protein as meat. A good thick lentil soup or a stew made of haricots and vegetables may thus be safely and economically substituted for the meat course in a dinner now and again, provided some first-class protein is being got for the day from milk, cheese, etc. It should be noted, however, that the protein of pulses is not of a very high biological value; while ninety-seven per cent. of animal protein can be utilised by the body only about eighty per cent. of the pulse protein can be used.

The pulses are useful for supplying iron and vitamin B; they contain no fat, however, so this should be added in some form to balance the food value of the dish. They are the cheapest form of protein, and should figure largely in a diet where economy is the first consideration. They require to be very thoroughly cooked but even then they are not very easily digested and are inclined to cause flatulence; it is the skin which is largely responsible for this and therefore it can be partly prevented by sieving.

The Soya bean is rich in fat and protein, the latter being of high biological value. It has more vitamin B_1 than other pulses and also contains vitamin A. It therefore forms a good substitute for meat.

COMPOSITION OF VEGETABLE FOODS



Nuts.—Nuts, being rich in protein and fat, are another exception to the general class of vegetable foods; they also contain a little starch. Vegetarians rely greatly on nuts for their supply of protein and fat, and if they are taken in conjunction with milk, eggs and cheese they meet requirement

quite satisfactorily. Their chief drawback is that they are difficult to digest, but this is often partly due to the fact that they are taken as an extra and not counted as part of the meal. Like the pulses they supply vitamin B.

COMPOSITION OF VEGETABLE FOODS

	FLOUR (National). Per cent.	OATMEAL. Per cent
Carbohydrate	71	65
Protein	12	12
Fat	1 to 2	9
Mineral Matter	2	2
Cellulose	1	1
Water	the rest	the rest

	BREAD (National). Wholemeal. Per cent.	NUTS. Per cent.
Carbohydrate	51	2 to 26
Protein	8	1 to 28
Fat	1	25 to 50
Mineral Matter	2	3
Cellulose	1	2
Water	the rest	the rest

	DRIED PULSES. (Average peas, beans, lentils). Per cent.	POTATOES Per cent.	GREEN VEGETABLES AND FRUITS. Per cent.
Carbohydrate	40 to 50	12	5 to 10
Protein	20	2	1 to 4
Fat	0	0	0
Mineral Matter	3	2	1
Cellulose	3	1	1 to 2
Water	the rest	the rest	the rest

These proportions are shown in the diagram on opposite page.

Sugar.—A certain difference in properties calls for the divi of sugar into two groups—(a) Sucroses, which include *sugar* and *lactose* and (b) Glucoses, which occur naturall many fruits and include *dextrose* and *lævulose*.

Ordinary household sugar is got from the sugar cane or sugar beetroot. Though sugar is regarded now as almo necessity and very large quantities of it are consumed, its us the form of cane sugar is of comparatively recent date Britain. It is known to have been used in China as far bac the beginning of the Christian era, but it was not until the teenth century that it was introduced into this country even then it was used only for the preparation of medicines as a luxury.

The method of obtaining sugar from the sugar beetroot discovered by a German about the middle of the last cent and now by far the greater proportion of the sugar used in country is got from that source. It is identical chemicall cane sugar but is more difficult to purify ; for this reason it not be quite so efficient as a sweetening agent, and not as g for jam making.

Demerara sugar is just cane sugar which has not had brown substance removed by the refining process ; it is pared from the best canes and is a little sweeter than white c sugar ; its distinctive flavour and colour make it particul suitable for sweetening coffee. There are, of course, ot brown sugars, but these do not have the excellence Demerara.

Maple sugar is got from the sugar maple tree, which grow Canada and certain parts of the United States. It is chemic the same as cane sugar and beet sugar but has its own flav and is used chiefly for confectionery. It is more generally u in America than in this country.

Invert sugar is a mixture of dextrose and lævulose ; it is duced when cane sugar is boiled with an acid and is form during the stewing of fruit, the making of jam, etc.

The glucose type of sugar is present in many fruits. It is used extensively in the commercial manufacture of confectionery and jam but, for the sake of cheapness, is prepared for these purposes by an artificial method—starch, got from cereal substances, being boiled with a dilute acid and so converted into glucose. It is also largely used in invalid dietary; being less sweet than cane sugar it can be added in larger amount to fruit drinks, etc., thus increasing the value of these. Glucose has other advantages over cane sugar—it needs no digestion and does not ferment so readily in the stomach.

Honey is a sugar which the bee prepares from flowers; instinct leads it to store this in a waxy frame called the comb, so as to provide a supply of food for the time when no flowers are to be found. Honey consists of a mixture of the two sugars dextrose and lævulose—these making up about 75% of its composition—and the rest is mostly water; it is therefore a concentrated energy-giving food; it is easily digested and has a certain laxative effect. The colour and flavour are due to substances got from the different flowers, and so we get the characteristic taste and appearance of heather honey, sycamore honey, etc.

Most foods, even though they appear dry, contain a variable quantity of water, but sugar is a hundred per cent. carbohydrate and is therefore a very concentrated food. This fact should be kept in mind in connection with the eating of sweets, and the number of these should accordingly be kept within reasonable limits.

Dehydrated foods.—These have recently come into prominence. They are of much value during a food shortage. Some lose little or none of their nutritive value during the drying process, but if vitamins B_1 or C are present they are lost to some extent.

CONDIMENTS AND SPICES

To make food more pleasant to taste, it is the custom to add to it those substances known as condiments and spices;

with the exception of salt they have no nutritive qualities, but are nevertheless of importance in the diet from a psychological aspect. Most of the spices are got from plants which grow in tropical countries. Their use dates back to the distant past and they are frequently mentioned in the Bible and in ancient Egyptian records.

Salt.—Common salt is the chemical substance sodium chloride. It is present in large quantities in sea water, and can be got from this source by evaporation; most of the salt used, however, is obtained from marine deposits which occur in many parts of the world, the crude salt being put through a process of recrystallisation to purify it.

Pepper.—This is obtained from the berries of a climbing plant which grows in the East Indies and Malay States. As the berries ripen they become red and at this stage are picked and exposed to the sun; on their becoming darker in the colour they are known as pepper-corns; these are ground into powder to produce black pepper. If the outer covering of the pepper-corn is removed before grinding, white pepper is obtained. Cayenne pepper is of quite different origin and is produced from the pod of an East Indian plant called the capsicum; it is particularly "hot" and besides being used as a flavouring agent it is used as an outward application to produce heat in the treatment of illnesses such as rheumatism, bronchitis, etc.

Mustard.—The mustard plant belongs to the cabbage species and though it can be grown in this and other European countries most of our mustard comes from Africa and America. The plant bears a yellow flower with very minute seeds; these are ground to powder and mixed with starch to form mustard. When mustard is mixed with water a pungent oil is produced which gives to this condiment a sharp, hot taste and makes it a suitable accompaniment to many kinds of meat.

Nutmeg.—This is got from the fruit of a tree which grows in the East and West Indies and in Malaya. It is a succulent fruit somewhat like a pear, but embedded in the soft part is a nut

surrounded by a brightly coloured sheath. The nut forms what is called nutmeg and the sheath gives us another spice called mace.

Cloves.—These are also got from a tree which grows in tropical parts, but in this case it is not the fruit but the small flower buds which form the spice. They are picked when they reach a certain stage in their growth and are dried in the sun.

Cinnamon is obtained from the bark of an evergreen tree which grows in Southern Asia. The stems are cut in the spring and the bark is separated from the inner wood; the cinnamon sticks consist of the inside layer of this bark. Cinnamon is largely used in medicine as well as in the kitchen.

Allspice or **Jamaica pepper.**—This is not a mixture of spices although the name would lead us to believe that such was the case. It is made from the berries of the Pimento tree, which grows in Jamaica and South America. The berries are picked and dried in the sun, and when ground have a flavour which greatly resembles a mixture of other spices, hence the name.

Ginger is got from the rhizome or underground stem of a plant which is a native of the East and West Indies; this stem is washed, the outside covering is removed and the remainder is bleached and dried to form ginger, which is sold either in the familiar irregular pieces or in the powdered form. Preserved ginger is made by using the rhizomes when the plant is very young and boiling the ginger prepared from these in a preserving syrup; this produces a less strongly flavoured substance which is extensively used in making sweetmeats, cakes, etc.

CHAPTER IV

BEVERAGES—ALCOHOLIC AND NON-ALCOHOLI THEIR USE IN THE DIET AND THEIR EFFE ON THE BODY

> " For in my youth, I never did apply
> Hot and rebellious liquors in my blood
> * * * * *
> Therefore my age is as a lusty winter
> Frosty but kindly."
>
> SHAKESPEARE

MOST beverages have no real food value, being made use solely because of their stimulating or narcotic effect. Milk, course, stands in a class by itself, as indicated in the last cha ter, and while it would be to everyone's advantage to drink fair amount of it daily, it should not be regarded primarily as beverage ; accordingly, it requires no more than this passi mention in the present chapter. Beverages may be divided in two distinct groups—alcoholic and non-alcoholic—and will dealt with under these headings.

ALCOHOLIC BEVERAGES

There are several types of alcoholic drinks, containing varyi amounts of alcohol. *Beer*—which includes porter, stout, al etc.—contains from 5 to 10 per cent. ; *wines* such as clare sherry, port and champagne contain from 10 to 20 per cent while *spirits*, for example, gin, whisky and brandy, have abo 40 per cent.

Alcohol has for ages past been regarded as a means whereby men and women can drown their troubles, but it is more than doubtful if it really serves the purpose to which it is so often put. The effect of alcohol is very similar to that produced by drugs; it partially paralyses the higher nerve centres, with the result that the pain of the body or the mind is dulled and that which occasioned the trouble seems to disappear. This effect persists for only a short time, however, and—as in the case of drugs—the temporary apparent improvement is followed by a period of depression which gives rise to a call for more alcohol to disperse it. So the vicious circle goes on and a craving may ultimately be established which is in many cases difficult, and sometimes impossible, to overcome.

Alcohol is often regarded as a stimulant, but though it may appear to have a beneficial effect it does not really strengthen any part of the body; the reason it is able to revive a person who has fainted is that it dilates the heart and the blood vessels, thus allowing the blood to flow more easily and giving the heart less work to do. If alcohol is taken habitually, however, the continued stretching induced injures the muscles of the heart and the arteries and so interferes with the circulation on which the health of the body so vitally depends.

Small quantities of alcohol may help digestion by reason of its stimulating the gastric juice but large quantities impede it. Alcohol, moreover, has an irritating burning effect on the delicate mucous membrane of the stomach, and this may lead to dyspepsia or to more serious trouble.

Alcohol is sometimes regarded as a food and can really claim this name—for it is burned in the body and can produce a certain amount of heat and energy—but any effect produced in this way is probably quite neutralised by its drugging properties, which cause a diminution of the value obtained from the real foods. The effect of " warming up the body " so often attributed to alcohol is largely a fallacy; by its dilating effect on the surface blood-vessels it causes an extra flow of blood there, and

it is this which gives the feeling of warmth. The amount of he actually produced may be quite negligible and there will be subsequent loss of heat out of all proportion to the heat pr duced ; corroboration of this is found in the fact that explore in Polar regions do not take alcohol as a heat giver, it bein usually withheld from them because of the lowering of boc temperature it is liable to produce.

Experiments show that alcohol has a paralysing effect on th reflex actions of the body—that is, the actions which are pr duced involuntarily—and in many cases sufficient alcohol ma have been consumed to affect these though no other sign c intoxication is visible. In this lies the danger of alcohol to th motor driver, for many of his actions at the wheel are reflex an he is dependent on these for the speed of action required in th emergencies which arise.

Alcohol also affects the great army of white corpuscles in th blood which provide us with our resistance against disease an with the wonderful healing power possessed by the body ; it ha been shown to have the effect of driving back these forces fron the place where their help in attacking and destroying germs i required, with the result that an alcoholic person has less chanc of resisting disease and less chance of recovering from a sever accident or an operation.

While statistics revealing the close connection betweei alcohol and crime scarcely come within the province of thi book, the tragic figures relating to the effect of alcohol on th toll of child life and on the welfare of children do, I think, com within its scope. Both infant mortality and maternal mortalit rates are affected by drinking among women and in many case where infants are born deformed, or blind, or suffering fron some other terrible handicap, the predisposing cause can ofte be traced to alcoholic excess in one or both of the parents Incidentally, the child of alcoholic parents is subjected to a home environment which is the worst possible for the formatio of its character ; besides being the victim of much cruelty, it i

often deprived of essentials of food in order that the parents may gratify their craving for liquor.

Cocktails.—Coming to another grade of society, cocktail parties owe their popularity to the light-heartedness and merriment which characterise them ; these effects are produced by the narcotic action of the alcohol in banishing the usual restraint felt in a social gathering, and in inducing a more ready flow of wit and a more genial acceptance of it. The composition of cocktails varies but in addition to their flavouring of fruit they contain a certain amount of such things as gin, whisky, brandy and absinthe. Many types of cocktail are highly intoxicating, and the unfortunate thing is that the majority of people who drink them have no idea of the amount of alcohol they are consuming, or of the risk they are running of developing a physiological craving for it.

When limited to small quantities and kept in its right place, viz., in the sickroom and for the aged, alcohol may be distinctly beneficial but it should be withheld even from invalids and elderly people unless considered really necessary, for many cases are known of the craving for it having been established through its being administered over-liberally during illness. This is specially liable to happen where there is a hereditary tendency to the craving.

NON-ALCOHOLIC BEVERAGES

The most commonly used beverages of this class are tea, coffee, cocoa and aerated waters.

Tea.—Though some people might nowadays wonder how they could exist without tea, it is not a very ancient form of beverage in this country. It was first brought to Britain from China by the Dutch East India Company in the reign of Queen Elizabeth and was considered a very special delicacy—as well it might be for it cost about ten guineas per pound!

It is got from the leaves of a shrub which grows in Ind China, Japan and Ceylon ; about 90 per cent. of what is used this country comes from India and Ceylon. The shrub pı duces its leaves several times a year, the tiny ones at the top the shoot being the most delicately flavoured and giving t best—and accordingly the most expensive—tea. The cheaı kinds are made from the coarser leaves further down the sho The quality of tea also depends on the country where it grown, that from India being much more strongly flavoured aı containing more tannin than China tea. Most of the teas sold this country are various blendings of the different varieties.

When the leaves have been picked they are crushed betwe rollers to break up the fibre and are then dried ; they are afte wards moistened and left exposed to the air to ferment, tl changes which occur during fermentation resulting in some the tannin being converted into insoluble compounds ; tl leaves are then re-dried in an oven and packed. Green tea made from the same plant as black tea but the fermentatio process is omitted, with the result that more tannin is left in tl soluble form ; it is largely used for blending on account of i very strong flavour.

Coffee.—Coffee was introduced into Britain only a few yea later than tea, but the amount consumed in this country is onl about a sixth of the amount of tea used. It is got from a larg shrub or small tree bearing a cherry-like fruit. The stone of th fruit is dried, the husk removed and the part inside—commonl known as the coffee bean—is roasted to develop its flavour ; is then ground to a powder.

Coffee came first from Arabia and the finest kind still com from that country ; about 80 per cent. of the amount consume however, comes from Brazil, and it is also got from other par of South America, from Central America, from Africa and fro the East and West Indies. The oil which gives coffee its flavou is very volatile and gradually passes off ; a better flavoure beverage is therefore obtained when the beans are freshl

roasted and ground. For the same reason, coffee should be kept in a tin with a tight-fitting lid; it will rapidly deteriorate if kept in a paper bag. A much larger quantity of coffee is used on the Continent than in the British Isles.

Cocoa.—This also is got from the fruit of a tree, its preparation being similar to that of coffee. After the stone has been dried and the husk removed, the part inside is broken down into what are known as cocoa nibs. These are very rich in fat and would give a very greasy beverage if used in their natural form. To avoid this they are turned into a paste by being passed through hot rollers; part of the fat is then extracted and the remainder of the paste, when cooled, solidifies into a hard block which is ground to form cocoa powder.

Composition of Tea, Coffee and Cocoa.—All infusions of these beverages contain *tannin*; the amount of this, of course, depends on the strength of the infusion but in infusions of tea and coffee of similar strength the quantity of tannin present is practically the same. The amount of tannin in a cup of cocoa is much less—indeed is quite negligible.

Tannin is the harmful part of tea and coffee. It is the substance which is used to make leather from skins and though very strong solutions are required for that purpose, it helps us to understand that the tannin present in strong tea and coffee may have a harmful effect on the delicate skin which lines the stomach. Tannin acts as an astringent, interferes with the work of the tiny glands which produce the gastric juice, and is occasionally the underlying cause of gastric catarrh and similar ailments; it also changes the proteins of food, rendering them hard and indigestible.

Another constituent of the infusions of tea and coffee is *caffeine* or *theine* (the same chemical substance named differently according to the source). It is a nerve stimulant and to it is due the refreshing property of the beverages. Caffeine also stimulates the heart and respiratory apparatus but, unlike other stimulating drugs, does not produce depression

after the effect has worn off. In the case of adults a mild s lation of the nerves will as a rule do no harm, but it is not for one to drink very strong tea or coffee or to drink it Caffeine is a drug which when prescribed by a doctor is not in larger doses than five grains and yet, since a cup of t coffee contains from 1 to $1\frac{1}{2}$ grains, it follows that many p are consuming eight grains—or even more—of caffeine in a Excessive use of tea or coffee may lead to indigestion, s lessness, constipation, nervousness, etc., and to drink beverages twice a day is quite often enough.

It is not good to stimulate the nerves of a child in any so tea and coffee should not be included in the child's diet u in small quantities to warm and flavour milk.

The nerve stimulant contained in cocoa, known as *bromine*, is much milder than caffeine, hence cocoa is less freshing than tea or coffee.

The third constituent in these infusions is a particul strong tasted *volatile oil*; this is present in very minute qu tities, but is sufficient to give the beverages their characteri flavour and aroma.

Cocoa differs from tea and coffee in containing a quantity fat and also a little starch and protein; these entitle it to called a food, a designation which the others can hardly cla Since only a small amount of cocoa is taken per cup, howeve will not add much to the value of a meal. Chocolate is m nourishing, as the fat is not removed from the raw cocoa du its manufacture into a sweetmeat, and a variable amount sugar is added. It has recently been found that tea, coffee cocoa contain some vitamin B.

The fact that all these beverages are made with hot water helps to increase their stimulating effect, for even a drink of water alone has a brightening effect on the heart beat; warmth also encourages the process of digestion and make meal more appetising. They acquire additional food valu taken with milk and sugar.

How to make a good cup of tea.—The taste of tea and its potential harmfulness depend greatly on how it is made. The teapot should first be thoroughly heated, and the water freshly boiled and really at boiling point when poured over the tea. This ensures a greater extraction of the oil which, as we have learned, is the flavouring factor. The tea should not be allowed to infuse for more than five minutes, this being sufficient time to allow the stimulating substance to dissolve. The tannin, on the other hand, dissolves more gradually and at the end of five minutes' infusing there is not enough to be injurious. If the tea is left stewing a quarter of an hour or more the amount of tannin becomes excessive; the bitter taste of over-infused tea is in reality due to the dissolving of too much tannin. The old-fashioned habit of adding a pinch of soda when infusing tea has its explanation in the fact that the soda softens the water and enables it to dissolve more of the constituents of the leaf.

It is not always economical to buy a very cheap tea as it often takes more of it to produce the required strength, and so the dearer variety may be cheaper in the end.

Chicory.—Chicory is got from a herbaceous plant which is cultivated in this country and other parts of Europe and in America; it also grows wild in these parts and may be found at the roadside or in the field. It has a leaf rather like the dandelion and a long tapering root somewhat resembling a carrot in shape. This root is washed, dried and roasted until it has become hard and brittle; it is then ground to a powder and is sold separately or mixed with coffee. Besides imparting to coffee a particular flavour which many people like, chicory produces a darker infusion and thus an appearance of strength. It contains some sugar but of course very little is used in making an infusion and so it does not appreciably contribute to the nutritive value of the beverage. It is cheaper than coffee, and a mixture of coffee and chicory must be correctly named and sold at the appropriate price, otherwise the chicory would be regarded as an adulteration.

Aerated Waters.—In making these, carbon dioxide i
into water under great pressure so that the water is n
dissolve three or four times its volume of gas ; it is the e
of this gas which causes the effervescence we see wh
pressure is released by the withdrawing of the cork fr
bottle. There are numerous varieties of such drinks
example ordinary water may be used, or it may be d
water ; in the latter case the drink is free from all n
matter and is useful in certain illnesses. In some vari
chemical substance such as sodium bicarbonate or pot
bicarbonate, or magnesium carbonate is added, this
designed to impart properties similar to those found in n
springs. In other varieties some distinctive flavouring a
added along with sugar, typical examples of this type
lemonade and ginger beer. The ordinary lemonade conta
lemon, but the preserved juice of that and other fruits c
bought ; these juices when diluted with water, form rea
drinks.

CHAPTER V

THE ART OF COOKING—BOILING, FRYING, STEWING, STEAMING, ROASTING. AVOIDANCE OF LOSS

> "Mrs. Beeton must have been the finest housekeeper in the world, therefore Mr. Beeton must have been the happiest and most comfortable of men."
>
> SIR A. CONAN DOYLE

PRIMITIVE man depended on uncooked foods; he lived on raw fruits and vegetables and on the raw flesh of animals. Tracing the course of civilisation, we find that after learning how to make fire he discovered—perhaps by accident—that food could be rendered more palatable by a process of cooking. The first method used was baking, carried out by laying the food on heated stones. Later, boiling was attempted, but this process was more difficult on account of the absence of pots and pans; he accomplished it by making a bag out of hide, placing the meat inside along with sufficient water to cover it, and heating the water by putting very hot stones into it. From these primitive methods we get a gradual development of the art of cooking, and with it the art of pottery and the making of utensils from iron, etc.

Cookery is not an art that can be learned entirely by theory, for much technical skill, ingenuity and originality are called for on the part of the cook; not only has the appearance of the dish to be considered but the nutritive value, the flavour and the digestibility have all to be carefully safeguarded.

Changes Produced by Cooking.—There are several reasons for cooking food, the chief one being that it prepares it for the

action of the digestive juices ; then it makes it attractive eye, produces flavours pleasing to the palate and has a ste effect—the strong heat employed destroying most of the that may be present in the food. A certain loss of nut may result from cooking, but the extent of this lies very in the hands of the cook.

When food is cooked the protein, carbohydrate and fat go certain changes. As an illustration of this, if some w egg—a typical protein—is gently heated in a test tube among water and a thermometer is immersed, it will be that when a temperature of 170° F. is reached the egg c lates—that is, turns into a soft solid; if heated still fu it changes into a hard, tough, leathery substance. I digestibility of these substances is tested it will be found the soft coagulated solid is more quickly digested than tough, leathery substance formed by prolonged heatin excessively high temperature. From this it is evident tha nutriment to be gained from protein foods may be mate reduced by over-cooking, for the value derived from depends greatly on the extent to which the food is digested. aim in cooking these foods should therefore be to have the tein in a soft and digestible condition when the food is put on table, thereby ensuring that the largest possible amoun protein will enter the blood stream and provide nourishn for the body.

Turning to the cooking of carbohydrates, a sweetish subst called *dextrin* is formed when the starch in food is subjecte strong heat without the presence of much moisture. Un starch, dextrin is soluble in water and so is more easily diges we find it in such things as biscuits, crusts of bread, t etc.

When sugar—the other form of carbohydrate—is heate melts, gradually changes in colour to a pale yellow and deepens to a dark brown. These changes—due to gra charring rather than to any difference in composition ha

occurred—are accompanied by a certain change of flavour; in the yellow stage we call the substance *barley sugar* and the dark brown substance, which has a very sharp taste and is useful for flavouring, is called *caramel*.

As regards fat, the change produced by cooking is not so marked, but the process certainly makes animal fats more acceptable to the palate. It should be remembered, however, that when fat is in the soft oiled condition produced by heating, it is not so digestible as when cold; also, if it is heated to a very high temperature some of the fatty acids which form part of its composition are liberated, and these are irritating to the lining of the stomach.

The common methods of cooking are boiling, frying, stewing, steaming and roasting.

Boiling.—Where meat is concerned the term boiling is used wrongly, for boiling means cooking at a temperature of 212° F. and meat should actually be cooked at about 180° F., unless for the first few minutes; if the temperature is kept at boiling point the protein will become hardened and indigestible. During cooking the meat loses some of its salts and extractives, and a very small amount of protein. There is also a loss of the B vitamins especially vitamin B_1.

It has hitherto been supposed that the loss of salts and extractives depends on whether the meat is first placed in cold or in boiling water, but it now appears that this belief is erroneous. Two investigators appointed by the Medical Research Council made an extensive and detailed investigation of the methods of cooking meat and fish, and as their results are now generally accepted, the time-honoured phrase "sealing the juices of the meat"—so dear to the heart of the cookery teacher and demonstrator—must be abolished, the investigators asserting that the extent of loss is the same whether the cooking is started in cold or in hot water. This statement, however, received some opposition from experienced cooks, who maintain that a better flavoured stock is obtained by placing the

meat in cold water and gradually raising the temperature, while a better flavour is secured in the meat by plunging it into boiling water for the first few minutes, and then reducing the temperature to simmering point for the remainder of the cooking.

Frying.—The temperature of the fat used in frying is very much higher than that of boiling water—in fact more than half as high again—and consequently the food cooks more quickly. In addition, the high temperature makes necessary some protection for the food to prevent the hardening of the protein; this may be provided by a coating of egg and breadcrumbs, a batter of flour and milk, etc. It is important that the fat should be smoking hot, otherwise it will soak into the food and make it very indigestible. The loss of salts and extractives is less by this method than by boiling but the vitamin loss is about the same.

Stewing.—This is the most useful method of cooking meat as it is suitable for all cuts; by careful stewing, the cheaper and tougher cuts can usually be made quite as digestible as the more expensive ones. Stewing has the additional advantage that any substances dissolved out of the meat during the cooking are served in the gravy, thereby preventing any loss. The more slowly the cooking is done the better is the stew, and everyone is familiar with the phrase "A stew boiled is a stew spoiled." If we want to get the vitamin value of vegetables, however, they should not be cooked in the stew as this method is too slow for vitamin stability.

Steaming.—This method is not economical as far as fuel is concerned, because of the length of time required. The long exposure to heat may be destructive to vitamins and the loss of salts and extractives is nearly as great as in boiling.

Roasting or Baking.—Roasting is actually the hanging up of a joint in front of a fire, but that is now a thing of the past, and what is generally referred to nowadays as roasting is really baking in the oven. This has the advantage of being a very

asty method, due to the fact that when the extractives of meat are subjected to strong heat without much moisture being present they undergo a change similar to the formation of caramel from sugar ; it is to this that the special flavour of roasted meat is due. The loss of salts and extractives is low.

Loss in Cooking.—When meat is cooked by any of the foregoing methods there is always a loss of weight, usually amounting to 25 per cent. or more ; this is mostly due to loss of water, with very small quantities of protein and some of the salts and extractives. The loss incurred in frying, steaming and roasting is due to what is called *shrink*, which occurs when the proteins of the meat begin to coagulate ; this results in some of the juices being expelled. The loss we get in boiling and stewing is due not only to shrink but also to a process known as *leach*, the salts in solution in the juice tending to pass out to the less concentrated liquid in which the meat is being cooked. In roasting, frying and grilling there is a smaller loss of nutriment, for the water evaporates quickly from the expelled juice and leaves most of the salts and other substances on the surface of the meat. One of the discoveries made by the Medical Research Council investigators, mentioned earlier in the chapter, was that in boiling meat the loss of protein is approximately from 3 to 5 per cent. while in roasting the loss is only between 1 and 2 per cent.

It is frequently stated that meat is better when cooked in an electric oven than in a gas oven. Since there is less ventilation in the electric oven there will be less evaporation—hence the meat is not so liable to become dry—but on the other hand rapid evaporation prevents the loss of salts, etc., so the gas oven has the advantage in that respect.

Vegetable foods gain weight when cooked, this being due to the absorption of water. The mineral salts and sugar they contain are soluble, however, and may be partly dissolved by the water in which the vegetable is cooked ; this is dealt with more fully in Chapter X.

Some people add soda when cooking green vegetables to preserve the colour. Soda is alkaline, and, as previously stated, vitamin C is more stable in an acid medium. There might therefore be a little destruction of this vitamin though the loss caused in this way is not now regarded as being appreciable, the organic acids in the vegetable counteracting the effect of the alkaline soda. It should be noted, however, that if vegetables are kept hot for some time after cooking they lose their vitamin C more quickly if they have been cooked with soda in the water.

CHAPTER VI

HOW FOOD IS DIGESTED

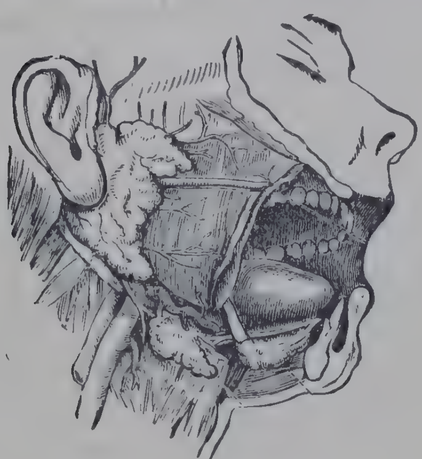
"Now good digestion wait on appetite and health on both."
SHAKESPEARE

IF there is anything wrong with our digestive system we think about it quickly enough, but when it is working smoothly I wonder if anyone ever stops to consider what a wonderful piece of apparatus it is! No matter what variety of foods is presented to it, it will reduce them all to a few simpler substances which are able to enter the blood and carry out their various functions of tissue building, etc. We are all the time quite unconscious of the changes going on, yet if these same substances were introduced into the blood by a process of injection very serious results might follow.

Purpose of Digestion.—When we swallow food it goes down into the stomach, as everyone knows, but if it remained there it would be of little use to us, for it is not only the stomach but every part of the body that requires to be nourished. In order that the food may be carried through the whole of the body it must get into the blood, and this is possible only when it is dissolved. A simple experiment here will help to explain the process : fill two tumblers with water, into one put some starch and into the other some sugar, and stir both well ; a distinct difference in the results will be found—the sugar will disappear entirely, forming a clear liquid, and we say it has dissolved, while the starch will produce a milky appearance on account of the particles remaining suspended but undissolved in the water.

As food has to get through the membrane in the walls of the blood-vessels to reach the blood it must be in solution like the sugar used in the experiment ; but the greater part of our food in the condition we eat it is actually undissolved like the starch, so it is the vital work of the digestive apparatus to change it into a soluble form capable of being absorbed.

The most important parts of this apparatus are the organs known as glands, which manufacture from the blood the materials required to form the digestive juices. These contain peculiar substances called *enzymes*, which though present in only small amount are able to produce important chemical changes in the food when the juices mix with it in different parts of the body.

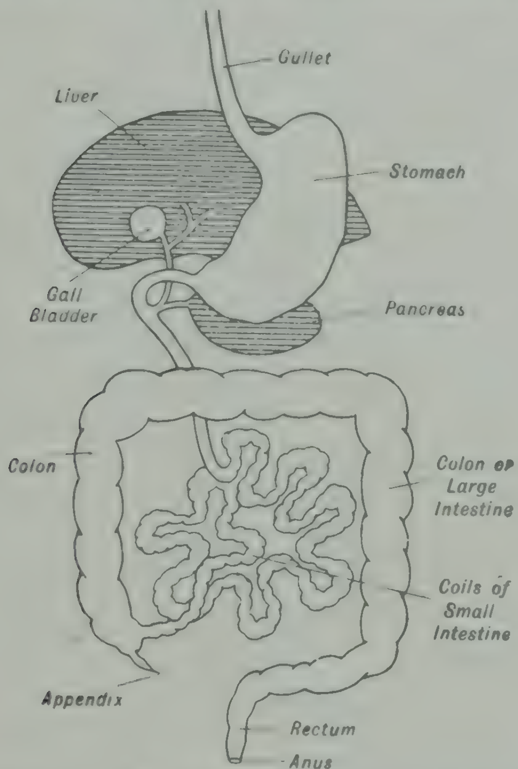


Salivary Glands.
Note position of glands—in front of ear, under lower jaw and under tongue.

Digestion in the Mouth.—Near the mouth are the salivary glands. There are three pairs of these, situated in the cheeks, under the lower jaw, and under the tongue respectively ; small tubes or ducts lead from them into the mouth. The sight or thought of food causes the brain to stimulate these glands into activity and they produce the digestive juice called **saliva**, so that preparation is made for the digestion of food even before we begin to eat it. Saliva consists largely of water but contains also an enzyme called *ptyalin*, which changes some of the starch of the food into sugar ; it does not affect the protein or fat. The saliva also contains certain alkaline salts, without which the ptyalin would be unable to act ; among these are calcium salts, the presence of which causes the formation of the tartar which collects on the teeth. In the mouth the food is broken up by the teeth to allow the digestive juices to penetrate more

thoroughly, and the muscles in the tongue keep moving it about and mixing it with the saliva.

Digestion in the Stomach.—The food next passes down the gullet into the stomach and there the action of the saliva on the starch continues for anything between twenty and forty minutes ; by that time the alkaline substances are destroyed by

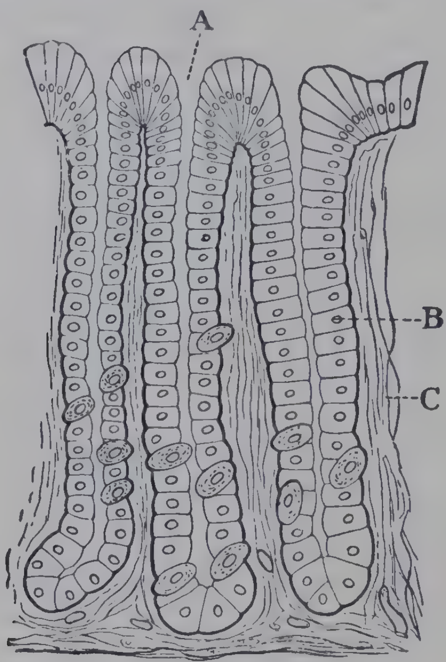


Alimentary Canal and Digestive Organs.

the presence of acid in the stomach and the action of the ptyalin thus comes to an end. In the stomach are large numbers of gastric glands, minute tubes which dip down into the wall of the stomach and provide **gastric juice.** This consists largely of water but contains also a little hydrochloric acid which gives it an acid reaction. The other constituents are the enzymes pepsin, rennin and the intrinsic factor of Castle. The protein of the food, left untouched by the saliva, is now acted upon

and is changed by the pepsin into peptone; the rennin clots all milk which goes into the stomach and the hydrochloric acid, besides enabling the pepsin to act, also helps to destroy any germs which may be present; the intrinsic factor of Castle in conjunction with an extrinsic factor in food has something to do with the formation of blood, and an absence of it gives

A.—Opening of gland.
B.—Principle cells of gland.
C.—Tissue between glands.



GASTRIC GLANDS OF STOMACH.

rise to the disease pernicious anaemia. The stomach also produces a substance which helps to maintain the nerve tissue of the spinal cord. Fat in the stomach remains unchanged.

Digestion in the Small Intestine.—The food usually remains in the stomach for several hours and is reduced to a soft creamy-coloured substance known as *chyme*, in which form it is ready to be passed on to the long coiled tube called the small intestine. It is in this that the greater amount of the digestion of food and its absorption takes place, only a very small proportion of it being absorbed when it is in the stomach.

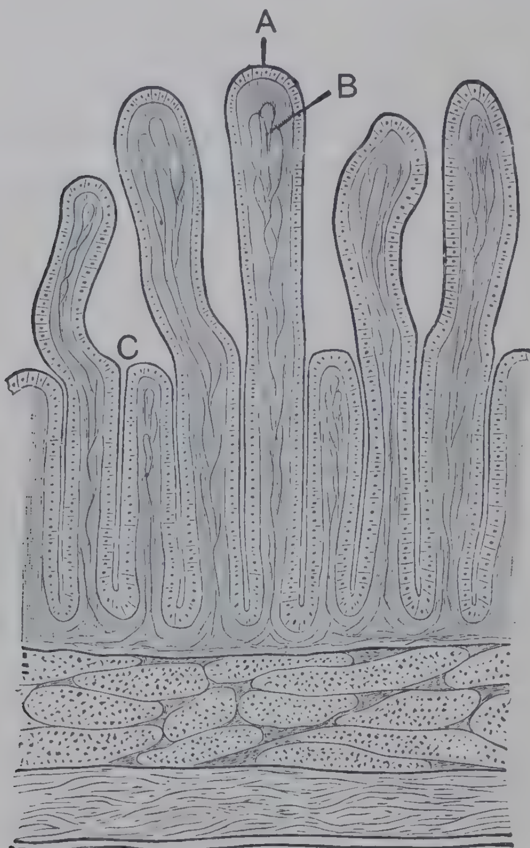
In the small intestine the food meets with three secretions

—bile, pancreatic juice and intestinal juice. **Bile** is produced by the liver, a large glandular organ lying near the stomach. It is stored in the gall bladder—a small bag attached to the liver—until the food enters the intestine; it is then carried by the bile duct to the intestine and there poured out on to the food. While the use of bile is not fully understood, there is no doubt that it plays a very important part in digestion; it contains alkaline salts and seems to make all the enzymes in the pancreatic juice more active; it is of special use in the digestion of fat and it also acts as a slight antiseptic, checking the putrefaction which is liable to go on in the intestine.

Pancreatic Juice, as the name implies, is produced by the pancreas, another gland lying near the stomach. In the same way as bile, the pancreatic juice is carried by a duct to the intestine. This digestive juice contains, in addition to water, alkaline salts and enzymes which are more powerful than those in the saliva and gastric juice. Starch and protein have a second chance of being digested here by the action of two enzymes called *amylase* and *trypsin*, the protein being changed to peptone and amino acids, while a third enzyme, known as *lipase*, helps to digest fat. The fat itself is insoluble and so is unable to be absorbed as such. It is therefore temporarily changed into substances which are soluble. The fat is split up into glycerine and fatty acids. The fatty acids then become changed into soluble substances which, along with the glycerine, become absorbed, and after absorption fat is re-formed as a milky fluid called " chyle ".

The other digestive juice present in the small intestine—**the intestinal juice**—carries on the digestion of protein, breaking it down into amino acids, and changes all kinds of sugar into glucose, which is the only sugar capable of being absorbed. The intestinal juice also helps to prevent the decomposition of food by the bacteria which swarm in this part of the alimentary canal.

Absorption of Food.—The substances having now been changed into the right form, the next process is their absorption into the blood stream. This takes place chiefly in the small



SECTION OF WALL OF SMALL INTESTINE.
A.—Villus.
B.—Blood-vessel and lymphatic.
C.—Opening of intestinal gland.

intestine, which is of such great length and is so extensively coiled that it provides a large surface for absorption in small space ; the surface of the inside of the intestinal wall is covered with numerous tiny projections called villi, and it is into the blood-vessels of these that the glucose and digested protein are absorbed. The glycerine and soap formed by the digestion of

fat pass into other vessels in the villi called lymphatics, reforming into fat as soon as they enter. As a milky fluid, known as *chyle*, the fat is carried by a large duct called the thoracic duct to a blood-vessel near the heart; so it gets into the blood stream and is either used to supply energy straightway or is taken to a part where it can be stored as reserve fat.

The blood with the newly-absorbed glucose and digested protein is carried first to the liver and is there relieved of some of its burden, the liver cells taking out most of the sugar and storing it as a substance called *glycogen*; the glycogen is later changed back into sugar and passes into the blood according to the body's demand for energy-giving material. The blood is then taken to the heart and by this organ is pumped all over the body, carrying with it to all parts the substances for repair, for work and for heat.

The Large Intestine.—The last section of the food canal is the large intestine, including the ascending, transverse and descending colons. Food remains longer in it than in any other part; it acts chiefly as a receptacle for that part of the food which is incapable of being digested; being of no use to the body and containing much which can do it harm, this residue has to be expelled as soon as possible. Its potential harmfulness will be understood when it is explained that there is a great increase in the micro-organisms at this stage, the number becoming greater the longer the residue remains. Though some of these organisms are harmless there are many which are putrefactive and—acting on the waste matter—produce toxins which, when absorbed, have a poisoning effect on the system, and produce many types of disease and ill-health. Before appendicitis, cancer, digestive weaknesses and other diseases of civilisation can be reduced or altogether eliminated, attention will have to be focussed on abolishing that faulty type of diet which prevents the residue of waste matter from being expelled as quickly as it should be, and so allows the work of these disease-producing bacteria to go on.

SUMMARY OF THE PROCESSES OF DIGESTION

Gland.	Secretion.	Where it mixes with food.	Substance acted upon.	Result.
Salivary glands.	Saliva.	Mouth.	Starch.	Sugar.
Gastric glands.	Gastric juice.	Stomach.	Protein.	Peptone.
Liver.	Bile.	Small intestine.	Fat.	Assists action of Pancreatic Juice.
Pancreas	Pancreatic juice.	Small intestine.	Starch Protein. Fat.	Sugar. Peptone & simpler substances. Digested with help of bile.
Intestinal glands.	Intestinal juice.	Small intestine.	Sugar. Protein.	Glucose. Peptone & simpler substances.

CHAPTER VII

DIET AND THE MIND. THE PSYCHOLOGICAL ASPECT OF FOOD

> "Better is a dinner of herbs where love is, than a stalled ox and hatred therewith"——"Better is a dry morsel and quietness therewith, than an house full of sacrifices (feasting) with strife."
>
> PROVERBS Chapters 15 and 17

The Mind and Digestion.—The finest and most beautiful olours may be supplied to the painter, but the real success of the icture depends on whether the hand that holds the brush is uided by the artistic mind. Similarly in diet and nutrition, nfinite care and patience may be exercised in producing meals roperly balanced as regards protein, carbohydrate, vitamins, tc., and leaving no loophole for the adverse criticism of the ietitian, yet all that preparatory work will be futile unless hese substances are dealt with in the proper way after they nter the body. The extent to which they are digested and, in onsequence, the extent to which they carry out their purpose in utrition is in reality largely dependent on the mind, probably nuch more so than the majority of people realise. As an nstance of this, the benefit derived from many of the proprietary foods which are advertised as giving renewed health nd vigour, or for which some similar bold claim is made, is equently in no way due to the mythical super-excellence ttributed to them but rather to the psychological effect of the lea presented to the mind of the purchaser that the food is oing to do him good.

No food is of any use to the body unless it can be absorbed into the blood and this, in turn, depends on how completely it is digested or changed into an absorbable form. As we learned in the preceding chapter, digestion is brought about by the secretion of certain juices, and it is here that the mind plays its part, for it largely regulates the quality and quantity of these secretions.

Arrangement of Meals.—The food substances themselves have an effect in influencing the production of the digestive juices. Fat, for example, tends to inhibit the secretion of gastric juice; this juice has an acid reaction and as food does not leave the stomach and pass into the intestine until it has been made acid, fat in a meal causes it to remain longer in the stomach. Carbohydrate, on the other hand, leaves the stomach rapidly, for it readily becomes acid. Protein is intermediate in this respect, leaving the stomach more quickly than fat but not so quickly as carbohydrate. A meal consisting chiefly of carbohydrate would leave the stomach in an hour and a half or less—at the end of which time we would feel in need of another meal—so to make the food remain longer in the stomach it is taken along with fat, e.g., butter; an example of a carbohydrate and fat meal of this nature is afternoon tea. Fat, on the other hand, should not be taken in large amount in conjunction with protein. Protein requires acid gastric juice for its digestion, and fat—as we have just learned—prevents this from forming readily, thus causing the food to remain an extra long time in the stomach. When this happens, the growth of bacteria is encouraged by the warmth and the fact that there is not enough acid present to destroy them, and harmful substances are produced when the bacteria act on the food.

Instinct has taught us to take meat before pudding and if we question the physiologist we shall find that we have been guided wisely. When the food is at the upper part of the stomach it is alkaline, for it has not by then been sufficiently mixed with gastric juice and at this part is digested by the saliva with which

t came into contact in the mouth; it then passes to the lower art where it is churned about and mixed with acid juice, the cid stopping the action of the saliva, helping in the digestion of rotein and killing the bacteria. Saliva has no digestive effect n protein and so the latter may go right down at once to the ower end of the stomach, while the pudding with its carbo- ydrate constituents is better to be in the upper part, thereby llowing the saliva to act for a longer period. If the order were eversed the carbohydrate would pass down to the lower end nd remain there for some time during which the protein ollowing it would be unable to become digested. Germs attack rotein more readily than any other food and would be given he opportunity of doing untold harm. In addition, by the ime the protein reached the lower part another supply of astric juice would be necessary for its digestion, but since the neal would by that time be over and the appetite satisfied, his would not be forthcoming.

We have a prominent exception to this order of things in the reakfast meal, where cereal is frequently taken before eggs, sh, etc. There is, however, a very good reason for this; the ody has been fasting for probably as long as twelve hours and he stores of energy-giving material have accordingly been sub- tantially reduced; there is therefore an urgent demand for an asily-digested carbohydrate which will pass quickly out of the tomach and into the intestine, where it will be digested and bsorbed into the blood without loss of time. Porridge is pecially useful in this way.

Soups and hors-d'œuvre have much the same rôle—that of reparing the way for what is to come, or "making good igestion wait on appetite." When the nerves of taste are ickled by something they appreciate they communicate the act to the various digestive glands and stimulate them to nanufacture their juices in greater amount, thus ensuring a nore complete digestion of the food subsequently introduced nto the stomach. Likewise, the savoury at the end of the

meal adds a finishing touch, as it were, to ensure that there will be a sufficient amount of juice for the digestion of all the courses.

Food Fads.—We are all familiar with the neurotic individual and food faddist who allows his mind to work on his digestive organs to such a degree that their natural action is interfered with, a condition of dyspepsia being the result in many instances. He continually meditates on whether a certain food he has eaten is going to give discomfort or not, and works himself up to such a state of anxiety on that score that he cuts out of his diet most of the things he would enjoy and makes himself a martyr to his stomach by eating things for which he has little or no relish. What, then, of his appetite juice? It is produced in only small measure, with the result that he gets a correspondingly small amount of good from his diet and so develops the usual ill-nourished appearance of the dyspeptic. His mind has had the effect of setting up a vicious circle between the starvation and the dyspepsia, and the only way to break this is to ignore the dyspepsia and take those appetising foods which have a reasonable degree of digestibility.

Idiosyncrasies.—The saying that one man's meat is another man's poison, however, is applicable to others besides cranks, as is proved by the frequency with which idiosyncrasies concerning certain foods are found in otherwise normal people. To one individual the smallest trace of egg will produce violent sickness, while another will develop a rash after enjoying a plate of strawberries. These phenomena also have their cause in the mind, acting through the nervous system. For example, an attack of sickness after a certain food has been taken may result in that food being regarded ever afterwards as an enemy of the body although it had no part whatever in producing the sickness. The condition is sometimes hereditary and is often so deeply rooted that it is useless to try to overcome it ; the only thing that can be done in such cases is to avoid the particular food which causes the trouble.

Stimulating the Appetite.—The housewife can do a great deal towards producing the right state of mind for the proper utilisation of food in the body by presenting it in a pleasing manner; the well-polished crystal, shining cutlery and well-cooked, daintily-served food all play their part in securing an ample flow of digestive juice, or "appetite juice" as it is sometimes called, and such a meal will be of much more use in the end than one containing the same dishes served in a dirty, slovenly fashion. It is probable that man in the savage state was able to enjoy his food in whatever way it was given to him, but our aesthetic taste has gradually developed as part of our civilisation and we have also become more and more dependent on our nerves. We can trace the development of this even in recent times, for there is now much more demand for the piquant sauce and the savoury morsel while the plainer foods which people once enjoyed no longer satisfy us.

In the housewife's hands also lies the avoidance of monotony; variety in the method of cooking and in the selection of meals from day to day is a point of much importance. We commonly attribute the improvement of appetite which occurs during a holiday to the "change of air" but, after all, the air in one place does not differ so very much from the air in another, and it is really the change of scene and the fact of getting away from what we have been accustomed to do and from the food we have been accustomed to eat that account for the stimulated appetite and the improvement in health.

Appetite is a fairly good indication of whether the mind is in a right state to produce the proper flow of digestive juices; everyone knows how grief or anxiety robs one of appetite and how the digestion is usually affected at such times. In this connection, some interesting dietetic information was gained from an experiment carried out on members of the Air Force; meals containing barium—which enables the rate of the passage of food through the alimentary canal to be watched—were given to a group of air pilots; these were men who of all people

were least likely to be affected by nerves, nevertheless it wa found that when flying over enemy territory the meal was he in the stomach much longer than the normal time, this bein attributed to the great strain and anxiety in the mind of the pilo causing their digestive organs to be kept in a state of tension. was observed that this effect continued for some time after th cause of anxiety was removed. When flying over friendl territory, no such effect was produced.

Anger, bad temper, discontent and worry all have a harmfu influence on the fate of our food. This has long been known t psychologists, but the words of Solomon quoted at the beginnin of the chapter show that it was even recognised the best part c 3000 years ago.

CHAPTER VIII

THE ARITHMETIC OF DIET—DIETARY STANDARDS. FOOD VALUES AND HOW TO CALCULATE THEM

"A dietary standard is an indication, not a rule."
ATWATER

MUCH research work has been done to determine what quantities of the food substances constitute an ideal diet. The subject has been investigated by feeding individuals on carefully weighed quantities of the foods and, by measuring and analysing all that is excreted, the actual amount used by the body has been found. Information on the subject has also been got from nutrition experiments with animals and from statistics.

THE STANDARD DIET

So many different factors affect the individual needs of a person that it is impossible to set down figures which will apply rigidly to everyone. A very general idea of the relative proportions of the food substances required per day is got by considering the needs of a man doing moderate work. He requires daily $2\frac{1}{2}$ to $3\frac{1}{2}$ **oz.** of **protein** (or about 1 gm. per kilogram of body weight), **3 oz.** of **fat, 16 oz.** of **carbohydrate** and **1 oz.** of **mineral salts.** Sometimes it is more convenient to have these quantities expressed as grams, and easily remembered, but sufficiently accurate figures are: **70 to 100 g. protein, 100 g. fat, 400 to 500 g. carbohydrate** and **30 g. mineral salts.** These

quantities are known as the "Standard Diet" and they represent the amounts deemed to be necessary to maintain a state of health and vigour without having an excess of unnecessary material to burden the system and overstrain the excretory organs.

We have already learned that fat and carbohydrate have the same function, viz., that of supplying heat and energy, so it is not difficult to understand why they are capable of being interchanged; a smaller proportion of fat in the diet can quite well be made up for by extra carbohydrate, but it must be kept in mind that for energy value it takes 2 oz. of carbohydrate to equal 1 oz. of fat. The interchange, moreover, should not be carried beyond a certain limit, otherwise digestion difficulties will arise. Another reason for limiting this interchange is—as explained in a previous chapter—that we must not cut down the carbohydrate too much in proportion to the fat or there will be incomplete combustion of the fat, resulting in acidosis.

Daily Allowances.—It is now generally considered that the adequacy of a diet may be judged from the Protective Foods and the calculation is based on the amount of protein, calcium, iron and the vitamins present. Of course the amount of food required per day varies according to the sex and age of the person and to the kind of work being done. The Food and Nutrition Committee of the National Research Council have considered the needs of different individuals and the figures they recommend are given in the table on page 88. These are what they regard as ideal or optimum allowances but they believe that, in the case of adults, health may be maintained though the allowances of mineral salts and vitamins are reduced to seventy per cent. of the optimum amounts.

The requirements of women during pregnancy and lactation are considerably higher than those given in the table for women.

It is generally considered that women require more iron than men who can do with very little.

About a third to half the total protein should be first class

protein which, as previously stated, is protein got from animal foods.

The actual amount of carbohydrate in a diet can generally be left to the appetite of the individual to decide, provided adequate amounts of the other food substances are known to be present.

It is difficult to state definite figures for the vitamin D requirements as this varies according to the length of time the skin is exposed to sunlight and to the intensity of this. An adult, getting little vitamin D in this way, will probably require about 400 I.Us. per day. Children have the greatest need for this vitamin.

Diet Calculation.—Having determined from the table the requirements of the people being catered for, we next proceed to examine their diet to ascertain if the quantities agree with those requirements. A list of the different foods in the diet together with the total quantities of each is drawn up and, opposite this, columns are allotted for the quantity of protein, fat and carbohydrate etc. in each. This can be calculated by using a table giving percentage values. For example, if one item were three quarters of a pound of wholemeal flour, and we have found from the table that the percentage (i.e. parts per 100 parts) of protein, fat and carbohydrate in wholemeal flour are 15·3, 3·1 and 68·0 respectively. The number of ounces of protein, etc., given by 12 ounces of flour can therefore be calculated by proportion, thus :

$$\text{Protein} \quad - \quad - \quad \frac{15{\cdot}3}{100} \times 12 \text{ oz.} = 1{\cdot}84 \text{ oz.}$$

$$\text{Fat} \quad - \quad - \quad \frac{3{\cdot}1}{100} \times 12 \text{ oz.} = 0{\cdot}37 \text{ oz.}$$

$$\text{Carbohydrate} \; - \quad \frac{68}{100} \times 12 \text{ oz.} = 8{\cdot}16 \text{ oz.}$$

These results are put into the respective columns and proceed in the same way with other foods contained in diet. It is most usual to calculate the quantities in gra and if this is done the weights of the foods must be convert into grams (1 oz. = 28·4 g.). An easier way to calculate value of a diet is to use a table which gives the grams or m.gra of the food substance per ounce of food (see page 88a). T value obtained for these is multiplied by the weight of food in ounces after making the necessary correction waste.

When all the columns have been completed, the totals gi us the amount of protein, fat and carbohydrate, etc., contain in the diet; comparing these totals with the quantities d manded by the standard reveals at once whether the diet deficient in any of the food substances and this deficiency c be rectified. Allowance should be made for the fact that some foods the total content of calcium and of iron is not a available.

CALORIE VALUE OR FUEL VALUE

Another way of estimating the value of diets is by calculati the **Calorie value.** Some people are rather afraid of this term they imagine it involves some deep scientific knowledge which beyond them, but the Calorie is merely a measure like the yar the pint, etc., and it is not necessary even to know its definitic to be able to use it. A Calorie is really a measure of heat, and is owing to the fact that food is able to be burned in the bod thereby producing heat, that it can be used to estimate th value of diets.

A Calorie being a measure must be an unchanging quantit and it is defined as the amount of heat required to raise one kil gram (about $1\frac{3}{4}$ pints) of water through one Centigrade degre

The amount of heat produced is always proportional to th energy expended, a simple illustration of which—allowing

better idea of the Calorie to be grasped—is that if a person who is sitting on a chair rises up, walks round the chair and sits down again, he will use about one Calorie of energy in doing so. From this it can be understood that a very large number of Calories will be required for all the work undertaken in the course of a day, as energy is needed for all conscious movements and also for the working of the involuntary muscles which keep the blood in circulation, promote the action of the lungs in breathing. etc.

By using an instrument called a calorimeter the scientist can measure the amount of heat that definite weights of the food substances are capable of producing ; the results are as follows .

	1 oz. of protein gives - -	116 Calories.
	1 oz. of carbohydrate gives -	116 ,,
	1 oz. of fat gives - - -	263 ,,
Likewise,	1 gm. of protein gives - -	4·1 ,,
	1 gm. of carbohydrate gives -	4·1 ,,
	1 gm. of fat gives - - -	9·3 ,,

Having found the number of ounces or grams of protein, etc., in a diet it is therefore possible to discover the number of Calories by multiplying by the appropriate figures. The Calories may also be calculated independently from tables which give the number of Calories given by one ounce of the respective foods. For example, from the table on page 89 we find that one ounce of wholemeal flour gives 65 Calories, therefore 12 oz. of flour will give $65 \times 12 = 780$ Calories.

Calorie requirements.—The number of Calories required per day depends on the kind of work being done by the individual. It is generally regarded that a man doing moderate work requires about 3,000 Calories per day.

Balance of Food.—If we are not taking enough food to provide a sufficient number of Calories to supply the demand for energy the body has to call on its reserve tissue to supply these

Calories and here, as in other concerns, it is not advisable borrow a thing from a place where it cannot well be spar The working of a diet in Calories tells us if the amount of foo adequate, but, as mentioned elsewhere, the diet may be from satisfactory despite a sufficiency in the amount of food. is therefore necessary also to make sure that the balance of fo is correct—that is, that there is a sufficient amount of **tissu forming material** in relation to the amount of **energy-givi material**. This is done by comparing the number of Calor given by the protein with the total number of Calories ; if t diet is satisfactorily balanced, the former should be from 10 15 per cent. of the whole and then there will be enough prote material for the necessary growth and repair, and enou carbohydrate and fat to supply the demand for heat a energy.

It is sometimes more convenient to calculate diets from t amount of cooked food, and if this is so the values for mo cooked dishes can be got from McCance and Widdowsor tables, but the recipes given in the book must be followe The calculations are similar to those which have already be described.

OTHER FACTORS INFLUENCING AMOUNT OF FOOD

The foregoing figures indicate the general food requiremen but there are many factors which influence individual cases. one would suppose, the heavier the body the greater the numb of cells it contains, hence the greater the amount of foo required ; but this also depends on whether the extra weight due to muscle—which is a very active tissue and is continual requiring to be repaired—or to bone or fat. A man who weight is due largely to muscle will require more food than o who owes his weight mostly to the size of his bones or to a lar accumulation of fat. The build of the body has also a distin

influence on the requirements. It is a well-known fact that a tall thin person usually eats more than a short stout one, and that he really needs more can be explained. While both bodies may have the same volume their surface areas differ; as an illustration of this imagine two rectangular blocks—one, 4 ft. high, 1 ft. broad and 2 ft. wide, representing the thin individual and the other 2 ft. high, 2 ft. broad and 2 ft. wide representing the stout one. It will be noted that the volume of each is the same but the surface area of the former is 28 sq. ft., while that of the latter is only 24 sq. ft. Now a great deal of heat is lost from the body by the skin, and so it follows that the greater the surface area of the body the greater will be the amount of food required.

DIET SHEET

The following illustration of a worked diet sheet for one day* shows the various points which have been explained in this chapter, and the results agree with the standard requirements detailed in the table on page 88.

People catered for:—A family consisting of father, mother and three children aged 6, 9 and 16 years respectively.

Meals.—

Breakfast—Porridge and milk, bread, butter, syrup, tea, cocoa (for children).

Lunch—Fresh fruit, e.g. oranges.

Dinner—Lentil soup, mince, potatoes, onions.

Supper—Fried herrings, bread, scones, butter, jam, tea, and (for the children) milk.

* In practice diet calculations are usually made for a period of not less than one week. All left overs must be weighed, and household stores of sugar, etc., weighed before and after the period in question to find how much has been used.

Food Value.

The working of the food value of the diet is shown on pag 87. In the first column are the total quantities of each food an in the second column the quantities after the correction has bee made for waste. For example, from the food value tables w find that in the case of herring there is 30 per cent. waste ther fore the amount available for food from 1 lb. of herring is

$$\frac{70 \times 16}{100} = 11{\cdot}2 \text{ oz.}$$

Each food substance is then worked out from the tables a already explained and the results put in the appropriate colum The total amounts got by addition can then be compared wit what they ought to be according to the recommended allowance given on page 88.

WORKED DIET SHEET.

	Wgt. in ozs. after correction for waste.	Protein. gms.	Calcium. m.gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Riboflavin. m.gms.	Nicotinic Acid m.gms.	Vitamin C. m.gms.	Vitamin D. I.Us.	Calories.
8 oz. flour	8	27·2	184	4·0	0	0·56	0·24	3·2	0	0	784
6 oz. oatmeal	6	20·4	96	7·2	0	0·78	0·24	1·8	0	0	666
2 lbs. bread	32	76·8	544	9·6	0	1 28	0·64	9·6	0	0	2240
6 oz. lentils	6	40·8	66	13·2	30	0·78	0·12	5·4	0	0	492
1 lb. mince	13·3	55·86	39·9	14·63	186·2	0·27	0·93	17·29	0	0	1183·7
1 lb. herrings	11·2	50·4	313·6	4·48	470·4	0	0·9	11·2	0	2688	526·4
4 pints milk	80	72·0	2720·0	0	2400·0	0·8	3·2	0	24	24	1360
4 oz. butter	4	0·4	16	0	4560·0	0	0	0	0	68	844
1 oz. margarine	1	0	1·0	0·1	450·0	0	0	0	0	56	218
3 oz. cooking fat	3	0	0	0	0	0	0	0	0	0	759
1½ lbs. potato	22·32	13·39	44·6	4·46	0	0·67	0·45	6·7	44·64	0	468·7
½ lb. turnip	5·2	1·04	88·4	0·52	0	0·05	0·05	1·56	36·4	0	26·0
½ lb. carrot	7·6	1·52	106·4	1·52	13148·0	0·15	0·08	1·52	22·8	0	45·6
1 lb. onion	15·2	4·56	136·8	1·52	0	0·15	0·15	0	45·6	0	91·2
1 lb. oranges	12	2·4	144·0	1·2	336·0	0·24	0·12	1·2	192·0	0	120·0
12 oz. sugar	12	0	0	0	0	0	0	0	0	0	1296·0
2 oz. syrup	2	0·2	14·0	0·8	0	0	0	0	0	0	162·0
4 oz. jam	4	0·4	12·0	1·2	8	0	0	0	12	0	284·0
1 oz. cocoa	1	5·8	14·0	4·1	14	0·03	0·08	0·3	0	0	125·0
		373·17	4540·7	68·53	21602·6	5·76	7·20	59·77	377·44	2836	11691·6

RECOMMENDED DAILY ALLOWANCES

(National Research Council on Nutrition, U.S.A.)

	Protein. gms.	Calcium. gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Vitamin C. m.gms.	Riboflavine. m.gms.	Nicotinic Acid. m.gms.	Calories.
MAN									
Sedentary	70	0·8	12	5000	1·5	75	2·2	15	250
Moderately active	70	0·8	12	5000	1·8	75	2·7	18	300
Very active	70	0·8	12	5000	2·3	75	3·3	23	450
WOMAN									
Sedentary	60	0·8	12	5000	1·2	70	1·8	12	210
Moderately active	60	0·8	12	5000	1·5	70	2·2	15	250
Very active	60	0·8	12	5000	1·8	70	2·7	18	300
CHILDREN									
1 to 3 yrs.	40	1·0	7	2000	0·6	35	0·9	6	120
4 to 6 yrs.	50	1·0	8	2500	0·8	50	1·2	8	160
7 to 9 yrs.	60	1·0	10	3500	1·0	60	1·5	10	200
10 to 12 yrs.	70	1·2	12	4500	1·2	75	1·8	12	250
Girls									
13 to 15 yrs.	80	1·3	15	5000	1·4	80	2·0	14	280
16 to 20 yrs.	75	1·0	15	5000	1·2	80	1·8	12	240
Boys									
13 to 15 yrs.	85	1·4	15	5000	1·6	90	2·4	16	320
16 to 20 yrs.	100	1·4	15	6000	2·0	100	3·0	20	380

Vitamin D is necessary for adults but amount depends on available sunshi

Children require 400 to 800 I.Us. of vitamin D per day.

In the case of adults health may be maintained by 70 per cent. of the valu given for mineral salts and vitamins.

The figures in this table are used by permission of the Controller of H.M Stationery Office.

TABLE OF FOOD VALUES (PER OUNCE OF FOOD)

The figures in this table are taken from "The Manual of Nutrition" (Ministry of Food), by permission of the Controller of H.M. Stationery Office. The values given are per ounce of the food.

Food.	Percentage waste.	Protein. gms.	Fat. gms.	Carbohydrate. gms.	Calcium. m.gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Riboflavin. m.gms.	Nicotinic Acid. m.gms.	Vitamin C. m.gms.	Vitamin D. I.Us.	Calories.
Meat													
Beef—average good quality	17	4·2	8·0	0	3	1·1	14	0·02	0·07	1·3	0	0	89
„ corned	0	7·1	4·5	0	3	3·1	0	0	0·04	0·5	0	0	69
„ stewing	25	4·8	4·5	0	3	1·1	14	0·02	0·07	1·3	0	0	60
Mutton	17	3·7	8·8	0	3	0·6	14	0·04	0·05	1·2	0	0	94
Pork	15	3·4	11·4	0	3	0·3	0	0·2	0·06	1·7	0	0	116
Bacon	12	3·1	12·8	0	3	0·3	0	0·17	0·06	1·2	0	0	128
Kidney	0	4·5	2·0	0	3	3·8	280	0·07	0·37	3·8	0	0	36
Liver—ox	0	4·8	1·7	1·4	3	3·9	4260	0·11	0·85	3·8	0	0	40
Meat pie	0	3·1	6·5	8·0	4	0·6	0	0·03	0·03	0·5	0	0	103
Meat paste	0	3·4	2·3	2·6	7	1·0	0	0·01	0·03	0·6	0	0	45
Spam, etc.	0	4·3	7·5	0	0	0·6	0	0·13	0·04	0·7	0	0	75
Sausage (pork)	0	3·0	5·1	3·7	9	0·3	0	0·05	0·02	0·5	0	0	73
Fish.													
Herring	30	4·5	3·3	0	28	0·4	42	0	0·08	1·0	0	240	47
Salmon—canned	0	5·7	2·8	0	85	0·4	71	0·01	0·06	1·8	0	170	48
Sardines	0	5·7	6·8	0	114	1·1	77	0·01	0·08	1·3	0	280	84
White fish	45	4·5	0·3	0	7	0·3	0	0·02	0·04	0·6	0	0	21
Dairy Products.													
Butter	0	0·1	23·4	0	4	0	1140	0	0	0	0	17	211
Cheese	5 (rind)	7·1	9·8	0	230	0·2	370	0·01	0·14	0·1	0	10	117

TABLE OF FOOD VALUES (PER OUNCE OF FOOD)—*Continued*

Food.	Percentage waste.	Protein. gms.	Fat. gms.	Carbohydrate. gms.	Calcium. m.gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Riboflavine. m.gms.	Nicotinic Acid. m.gms.	Vitamin C. m.gms.	Vitamin D. I.Us.	Calories.
Egg—fresh	12 (shell)	3·5	3·3	0·3	17	0·8	280	0·04	0·11	0	0	17	45
,, dried	0	13	11·9	0·9	62	3·1	850	0·11	0·37	0·1	0	68	163
Milk—whole	0	0·9	1·0	1·2	34	0	30	0·01	0·04	0	0·3	0·3	17
,, unsweetened condensed	0	2·0	2·3	2·7	69	0·1	90	0·01	0·1	0·1	0	1·0	40
,, sweetened condensed	0	2·3	2·6	14·1	82	0·1	105	0·03	0·10	0·1	1·0	1·0	89
,, dried, whole	0	7·3	7·6	10·1	254	0·2	300	0·08	0·33	0·2	0	3·0	138
,, dried, skim	0	10·2	0·2	13·6	348	0·3	9	0·11	0·45	0·3	0	0	97
Fats													
Butter	0	0·1	23·4	0	4·0	0	1140	0	0	0	0	17	211
Margarine	0	0	24·1	0	1·0	0·1	450	0	0	0	0	56	218
Lard, etc.	0	0	28·1	0	0	0	0	0	0	0	0	0	253
Cereals													
Flour—white	0	2·3	0·3	21·6	5	0·4	0	0·02	0·01	0·3	0	0	98
,, wholemeal	0	4·3	0·9	17·4	10	1·0	0	0·13	0·06	0·8	0	0	95
,, national (80% extraction)	0	3·4	0·4	20·2	23	0·5	0	0·07	0·03	0·4	0	0	98
Bread—white	0	2·3	0·2	15·6	4	0·2	0	0·01	0·01	0·2	0	0	73
,, wholemeal	0	3·1	0·6	11·2	7	0·7	0	0·09	0·05	0·6	0	0	65
,, national	0	2·4	0·3	14·6	17	0·3	0	0·04	0·02	0·3	0	0	70
Biscuits (plain)	0	2·9	2·1	20·8	8	0·4	0	0·08	0·03	0·3	0	0	116
Barley, pearl	0	2·2	0·5	20·8	3	0·2	0	0·03	0·01	0·7	0	0	97

TABLE OF FOOD VALUES (PER OUNCE OF FOOD)—*Continued*

Food.	Percentage waste.	Protein. gms.	Fat. gms.	Carbohydrate. gms.	Calcium. m.gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Riboflavine. m.gms.	Nicotinic Acid. m.gms.	Vitamin C. m.gms.	Vitamin D I.Us.	Calories.
Rice	0	1·8	0·3	22·2	1	0·1	0	0·02	0·02	0·3	0	0	99
Shredded wheat	0	3·9	0·7	18·7	10	1·4	0	0·01	0·02	0·3	0	0	97
Pulses.													
Haricot beans	0	6·1	0	11·6	51	1·9	0	0·13	0·08	0·6	0	0	71
Lentils	0	6·8	0	13·6	11	2·2	5	0·13	0·02	0·9	0	0	82
Peas (dried)	0	7·0	0	14·2	17	1·3	19	0·13	0·08	0·6	0	0	85
Soya bean	0	8·5	4·3	9·4	67	2·6	25	0·24	0·06	1·2	0	0	114
Vegetables.													
Cabbage	30	0·4	0	1·4	18	0·3	85	0·02	0·02	0·1	20	0	7
Carrot	5-20	0·2	0	1·4	14	0·2	1730	0·02	0·01	0·2	3	0	6
Cauliflower	30	0·7	0	0·8	14	0·2	0	0·02	0·02	0·2	20	0	6
Lettuce	20	0·3	0	0·5	7	0·2	380	0·02	0·02	0·1	4	0	3
Onion	5	0·3	0	1·3	9	0·1	0	0·01	0·01	0	3	0	6
Peas (fresh)	60	1·6	0	2·7	4	0·5	47	0·12	0·03	0·2	8	0	17
Potatoes	7-25	0·6	0	4·6	2	0·2	0	0·03	0·02	0·3	2 to 8	0	21
Spinach	25	0·8	0	0·7	20	0·9	1230	0·03	0·06	0·1	18	0	6
Tomato	15	0·3	0	0·7	4	0·1	280	0·02	0·01	0·1	7	0	4
Turnip	35	0·2	0	1·0	17	0·1	0	0·01	0·01	0·3	7	0	5
Watercress	15	0·8	0	0·2	63	0·4	475	0·03	0·02	0·5	17	0	4
Fruits (Fresh).													
Apple	20	0·1	0	3·0	1·0	0·1	4	0·01	0	0·1	1·0	0	12
Banana	40	0·3	0	4·9	2·0	0·1	8	0·01	0·01	0·2	3	0	21
Date	14	0·6	0	16·3	19	0·4	9	0	0·01	0·1	0	0	68
Lemon	30	0·2	0	0·8	20	0·1	0	0·01	0	0	12	0	5
Orange	25	0·2	0	2·2	12	0·1	28	0·02	0·01	0·1	16	0	10

TABLE OF FOOD VALUES (PER OUNCE OF FOOD)—*Continued*

Food.	Percentage waste.	Protein. gms.	Fat. gms.	Carbohydrate. gms.	Calcium. m.gms.	Iron. m.gms.	Vitamin A. I.Us.	Vitamin B_1. m.gms.	Riboflavine. m.gms.	Nicotinic Acid. m.gms.	Vitamin C. m.gms.	Vitamin D. I.Us.	Calories.
Pear	25	0·1	0	2·7	2	0·1	1	0·01	0·01	0·1	1	0	11
Plum	6	0·2	0	1·6	4	0·1	38	0·01	0·01	0·02	1	0	7
Fruits (Dried).													
Apple	0	0·6	0	12·5	8	0·6	8	0	0·01	0·4	0	0	52
Apricot	0	1·4	0	11·1	26	1·2	473	0	0·12	0·6	0	0	50
Fig	0	1·0	0	13·5	81	1·2	9	0	0·08	0·5	0	0	58
Prune	17	0·7	0	10·3	11	0·8	237	0	0·04	0·6	0	0	44
Raisin	8	0·3	0	16·5	17	0·5	5	0	0·01	0·1	0	0	67
Fruit (Canned).													
Apricot	0	0·1	0	3·5	4	0·1	47	0	0·02	0·1	1	0	14
Peach	0	0·1	0	3·9	2	0·2	47	0	0	0	1	0	16
Pineapple	0	0·1	0	4·9	3	0·2	6	0·01	0·02	0	3	0	20
Sweets													
Chocolate (plain)	0	1·3	9·2	15·0	7	0·9	7	0·03	0·07	0·3	0	0	148
Jam	0	0·1	0	17·6	3	0·3	2	0	0	0	3	0	71
Sugar (white)	0	0	0	27·0	0	0	0	0	0	0	0	0	108
Syrup	0	0·1	0	20·2	7	0·4	0	0	0	0	0	0	81
Nuts.													
Cocoanut	30	1·1	10·2	0·9	4	0·6	0	0·01	0·03	0·1	0	0	100
Peanut	30	8·0	13·9	2·2	17	0·7	0	0·25	0·08	2·6	0	0	166
Beverages.													
Tea (with milk and sugar)	0	0·1	0·1	0·8	3	0	4	0	0·01	0	0	0	5
Cocoa ,, ,, ,,	9	0·2	0·2	0·9	3	0	3	0	0	0	0	0	6
Cocoa powder	0	5·8	7·3	8·9	14	4·1	14	0·03	0·08	0·3	0	0	125

CHAPTER IX

FOOD FOR THE CHILD. LAYING THE FOUNDATIONS OF A HEALTHY LIFE

"As the twig is bent the tree grows——The children of to-day are the men and women of to-morrow."

Effects of Malnutrition during Childhood.—There is no more potent factor in determining the degree of health a person enjoys in adult life than the diet received during childhood, and probably the most important time of all is from infancy to the age of five, when the real foundation is being laid. Many a person has been doomed to a life of general ill-health, deformity or complete invalidism by having a poor unstable foundation laid down in these early years.

Though much is now being done to safeguard the welfare of the child, statistics show that there are still a large number of badly-nourished children in this country; while some of these are probably the victims of the food faddist the majority of cases of under-nourishment are undoubtedly due to poverty. Despite the most careful management and the strictest of economy in the homes of the poor, smallness of income makes it a matter of the utmost difficulty to procure all that is necessary for proper nutrition, and we are all familiar with the white pinched faces so often seen in the meaner streets of our towns and cities. All badly-nourished children are not thin, however; there is the soft, flabby, unhealthy fatness caused by a surfeit of carbohydrate, and this is the kind of child who usually shows least resistance to disease. If we investigate the causes of the deaths which make up the infant mortality rate in the United Kingdom we will find that a large proportion of these deaths

are caused by improper feeding and accordingly comes with[in] the " preventable " category. Though the mortality rate [is] being gradually reduced, it is still much too high.

Needs of the Child.—To be able to choose the right food f[or] children it is essential to know something about their need[s]. First and foremost there is a special demand for the tissu[e-] forming substances, viz., proteins and mineral salts, the forme[r] building up the softer parts of the body and the latter helping t[o] convert the soft flexible cartilage into strong hard bone. If th[e] foundation is to be a sound one the very best quality of buildin[g] material must be provided and so the first-class type of protein[,] viz., milk and eggs, must be well represented in the diet.

A child is seldom at rest and we must cater for this extr[a] output of energy by foods containing fats and carbohydrates[.] Fats are a vital part of the diet, not only because of their energy[-] giving power but also because many of them are associated wit[h] important vitamins.

Vitamins, of course, have a special rôle and it is only necessary to recall their functions to understand their significance i[n] the child's diet: vitamin A—growth-promoting; vitamin D— rickets-preventing; vitamin B—strengthening and stabilising effect on the developing nervous system; vitamin C—essential for health and vigour.

There is not much need to stress the importance of carbohydrate; while a certain amount of this is very necessary, one of the commonest faults in the diet of many children to-day is the presence of too much carbohydrate.

INFANT DIET

Value of Human Milk.—The best food of all for the young baby is its mother's milk, the food nature provides for it. Human milk has many advantages. It contains all the substances necessary for the growth of the baby, in the form it can make best use of them, and the milk changes in composition as

time goes on in a manner just suited to the changing needs of the child. Human milk is sterile—a point of the greatest importance—for the delicate organs of the infant are much more readily affected by harmful organisms than those of an older person. Convincing proof of the superior value of human milk is provided by the fact that almost five bottle-fed babies die annually to every one that is breast-fed. Even in later years, a child who has been breast-fed during infancy is usually more robust and less susceptible to illness.

Number of Feeds.—Feeds should be given every three or four hours; this means five or six feeds in the day and it should not be necessary to give anything during the night. It is a mistake both for the mother's sake and the baby's to feed it too often. Breast feeding should be continued if possible for about eight months. Weaning should be very gradual, a preparation for it being started about the sixth month, when small quantities of suitable foods such as oatflour porridge, etc., may take the place of some of the milk, and by the eighth or ninth month breast feeding may be discontinued. The diet should then consist of a basis of milk fortified by such things as oatflour, cereal puddings, lightly-cooked egg, strained broth, rusks, etc., and a little fruit juice. Milk, as we have learned, is deficient in iron but a child up to eight months or so is in no need of this, as it is provided when born with a supply to keep it going for that time, and after that iron will be got in such things as egg, gravy of meat, etc.

Artificial Feeding.—If circumstances do not permit the mother to nurse her baby, some good artificial food must be used. It is important that this should be suited to the age of the child. Many of the foods on the market contain starch and such a food should never be given to a baby under six months; at that age starch cannot be digested and so it is more of the nature of a poison than of a food for the child.

Cow's milk is the natural food of the calf, the needs of which are of course by no means identical to those of the baby. If,

therefore, cow's milk is used in infant feeding, it should be modified to suit the child in the different stages of growth. Authorities differ in their opinion of how this should be done and many tables have been compiled to show the quantities of sugar, water, etc., that should be added at different ages. No hard and fast rule should be drawn up with regard to such a table, as much depends on the child; a small delicate baby may require a more diluted milk than a strong healthy one of the same age.

Probably the most satisfactory method of modifying the milk is one based on the weight of the baby rather than on its age. Such a scheme can be worked out from the following:

(1) To provide the amount of protein that is necessary, the milk required per day is one tenth of the weight of the baby.

(2) 45 Calories are required per day for every lb. of body weight. (Note: 1 oz. of milk gives approximately 20 Calories).

(3) $2\frac{1}{2}$ to 3 oz. of fluid are required per day per lb. of body weight.

(4) 1 teaspoonful of sugar gives 30 calories.

These quantities, worked out for a baby weighing eight pounds, would be:

Milk required per day for supplying sufficient protein $= \frac{8}{10}$ lb. or approximately 13 oz.
Calories supplied by 13 oz. of milk, $13 \times 20 = 260$.
Calories required per day by baby of eight lb. $45 \times 8 = 360$.
Therefore, Calories still to be supplied are $360 - 260 = 100$.
These would be got from $3\frac{1}{3}$ teaspoonfuls of sugar.
Fluid required per day, $2\frac{1}{2} \times 8 = 20$ oz.
Therefore water required per day is $20 - 13 = 7$ oz.
The total quantities for the day would therefore be:
13 oz. of milk, 7 oz. of water and $3\frac{1}{3}$ teaspoonfuls of sugar.

As the child grows older and the amount of sugar by the above method of calculation increases, it is advisable to make up with extra milk some of the additional Calories that are required, the amount being regulated by the condition of the baby ; too large quantities of sugar are apt to cause fermentation and hence indigestion. Some extra cream may be added to the milk, but a better plan is to give a teaspoonful of cod-liver oil three times per day. About a dessertspoonful of orange juice should be given daily to supply vitamin C, this being specially necessary when sterilized milk or artificial foods are being used. Black-currant juice may be given for the same purpose when it is available. Weight is a good indication of whether a baby is being properly nourished ; it should be weighed every week, and unless something is wrong there should be a gain of five to eight ounces per week.

VARIATION OF DIET WITH AGE OF CHILD

A child of one year has a fairly well-developed digestive apparatus, and can tackle quite a variety of foods. Milk should still be the basis of the diet and should form part of every meal, but the quantities of the other easily-digested foods already included in the diet should be increased. Vegetables can now be introduced, but the coarser ones should be sieved and potatoes should be given only in moderation. Rusks can be easily made by cutting fingers of plain sponge cake, placing them in a slow oven and turning them occasionally till crisp and slightly brown; thin wafers of bread toasted in the oven and known as fairy toast are also suitable and are very easily digested if treated in this way. Some fruit juice or tomato juice should be given each day. As soon as the teeth begin to make their appearance through the gums it is time to encourage the habit of mastication, both by teaching the child to chew food properly, and by the choice of foods which will lead to this being done ; when food is well chewed the more thorough penetration of the

digestive juices is facilitated and the act of chewing—especiall if it is a crisp dry food—encourages the secretion of saliva which plays an important part in the preservation of the teet as well as in the digestion of food.

By the time the child is two years old meat may safely find place in the diet. Red meat should not be given frequently a this stage, but a little well-minced mutton once or twice a wee will usually be digested satisfactorily ; this will also help t supply iron, which is apt to be rather deficient in the diet at thi period. The amount of fruit may be increased, but hard frui such as apple should be scraped to a pulp. This is best don with a silver knife.

From three years onwards the child should be able to launc forth into a fairly ordinary type of menu, still keeping of cours to the lighter kinds of foods and bearing in mind the importan part played by milk, vegetables and fruit. Bread is bes toasted, as it encourages mastication. Such things as cornflour semolina and custard powders should be used sparingly.

The Oslo Breakfast or Health Meal.—These bear out th importance now attached to the presence of protective food in a child's diet. The Oslo Breakfast, so called because firs used in the schools in Norway, originated from the suggestion of a doctor that the health of children would be improved by giving them, when they arrive at school in the morning, a mea containing important protective foods which they are probably not getting in sufficient amount at home. It consists of such things as milk, wholemeal bread, butter, cheese, fruit or salad A Health Meal on similar lines but given at mid-day was adopted in some schools in this country with marked beneficia results.

Psychological Aspect.—Though the appetite of a healthy child does not as a rule require tempting, the psychologica aspect of food does play a part, and with very little extra trouble a dish can often be presented in such a way as to deligh the eye and muster to the full the forces of digestion. The

powers of imagination at this stage of life are wonderful; for example, there is the case of the child who, to the vexation of her parents would not be persuaded to touch milk, but would drink as much as they wished—and seemed thoroughly to enjoy it—provided it was put into the glass out of which her father drank his wine.

Cases are occasionally encountered where a child refuses certain foods without any apparent cause; such dislikes are usually of nervous origin and require careful handling. They frequently occur at the stage when the child passes from the purely milk diet to one containing some solid substances, and may be due to a certain timidity at the new type of food and to a sub-conscious fear of choking. On the other hand, the refusal of food may be indirectly brought about by the too obvious concern of the parents. Children are by nature self-centred and dominate their own little world; on finding that they focus the attention of everyone on themselves by refusing food, they do so to enjoy the stir and the visible manifestation of their own importance. If the parents in such a case would assume an air of indifference instead of appearing worried, the phase would probably be of short duration.

Prevention of Constipation.—Habits of constipation are frequently formed during childhood. If more trouble were taken to dispel the tendency to the condition by careful dieting instead of by resorting to the apparently simpler method of giving aperient medicines, it would go a long way to eradicate that widespread evil of modern civilisation. With children under five discretion is necessary in choosing a food or foods to supply roughage, for undue irritation of the digestive tract must be guarded against; this, however, can usually be obviated by sieving the foods. Prune juice is particularly effective as an aperient and is usually enjoyed by children.

CHAPTER X

SOME DO'S AND DON'T'S OF DIET: "GOD SENDS THE MEAT BUT THE DEVIL SENDS THE COOKS"

"Man does not die: he simply kills himself."

THE *text* I have chosen for this chapter is a statement first made about two thousand years ago, when the Roman Empire was at the height of its glory. The pleasures of the table were beginning to take too great a place in the life of the people, and a wise man of the time, seeing in this the seeds of Rome's downfall, uttered the sentence as a warning; it is frequently quoted to-day, with as much purpose as when it was first delivered.

Diet in different classes of homes.—In the foregoing chapters we have learned most of the points about the constituents of foods, how these provide all that is necessary for nutrition, etc., and we now arrive at the stage when we must consider some general types of diet and the factors which make them satisfactory or otherwise. In doing so it is advisable to divide homes into three groups—(1) Rich; (2) Middle Class; (3) Poor.

Group (1).—In this class the commonest fault is that more food is consumed than is really required; money need not be spared, and the experienced cook produces tempting dishes, which, while having their value, have also a disadvantage in causing the appetite to be tempted beyond the needs of the body. In any case, people belonging to this class generally require less food than those who have to make daily use of their muscles in earning their living. There is very often an excess of protein foods in the diet, and this leads to the production of uric acid with its attendant ills—rheumatism and kindred

diseases. Addison in one of his essays wrote: "When I behold a fashionable table set out in all magnificence, I fancy I see gouts and dropsies, fevers and lethargies with other innumerable distempers lying in ambuscade among the dishes." The great essayist spoke perhaps truer than he knew, for it is generally recognised to-day that as much trouble is caused by eating too much as by eating too little.

Group (2).—If the number of satisfactory diets in each of the three groups of homes were counted, we would most likely find them most numerous in the second group. People of the middle class are sufficiently well provided for, financially, to be able to purchase the necessities, but the tighter hold which has to be kept on the purse helps to prevent the errors mentioned in the first class. In the homes of the rich both lunch and late dinner are often substantial meals in which protein foods predominate. In middle class homes, a very light lunch is taken with late dinner, or midday dinner is the one substantial meal of the day, some light protein food such as egg or fish being provided for supper.

Group (3).—The production of a satisfactory diet in poor homes presents the greatest difficulty, but here there are two classes—(*a*) where the amount of money to be spent is small and the diet is necessarily inadequate no matter how thrifty the housewife is; and (*b*) where the amount of money would be sufficient with wise spending, but where owing to laziness, carelessness or ignorance, or a combination of these, it is wrongly distributed on the purchases or is spent on unnecessary luxuries or pleasures. Although people are gradually learning what is good and bad in food, there is still a great deal of ignorance, the diet in many homes consisting of a dreary round of preserved meat, bread, tea, margarine and jam, with little of the variety which makes food interesting and appetising. Dinner is invariably something to fry or something preserved. Fried foods are indigestible and an excessive use of preserved foods is not good; they have not such a high value as freshly cooked foods

and this counterbalances the advantage that may be claimed for them in regard to the saving of fuel. Broths and soups are not nearly so frequently made as they used to be and many mothers now send their children off to school on a breakfast of bread and margarine because they find that much easier than taking time to prepare porridge. The great variety of made-up dishes now sold has gone far to change the food habits of the people and the plain, nourishing but cheap foods such as porridge and soup, which were at one time a standby in poor homes, no longer satisfy; something sweeter or more savoury is demanded instead. In general, the chief fault likely to be found in homes where money is scarce is a deficiency of first-class protein, of vitamin-containing fats and of mineral salts.

Faults in Cooking.—Many a good food is spoiled by bad cooking, and probably the fault lies more often in over-cooking than in under-cooking. For example, a stew may be put on too soon, with the result that long after it is sufficiently cooked it is left simmering, thus gradually losing its value. On the other hand, we may have the opposite extreme—put on too late, it is allowed to boil furiously and then, as we have learned, the protein becomes hard, tough and indigestible.

The old saying that "God sends the meat but the Devil sends the cooks" is particularly applicable to vegetables, for the value of these often suffers greatly at the hands of the cook. The vitamin in vegetables is very easily destroyed at the temperature required for cooking, and some of the valuable salts are often poured down the sink with the water in which the vegetable has been boiled. On that account, it is important that some, at least, of the vegetables in the diet should be taken in the uncooked salad form, and that the cooking of vegetables should be done in such a way as to preserve the value as far as possible.

The following hints on the preparation and cooking of vegetables will, if carried out, help to preserve their value;

First come the purchase and preparation of the vegetable for cooking:

Do not buy vegetables which are bruised or wilted as the vitamin value of these is likely to be low.

Store vegetables in a cool place.

Do not soak vegetables overnight or a considerable amount of the soluble nutritive constituents will be dissolved and so lost. If soaking is necessary add salt to the water in the proportion of about a dessertspoonful to a pint and this will make the water less able to dissolve other substances.

Shred or slice vegetables with a sharp knife and do not cut into very small pieces.

The outer leaves of cabbage should not be discarded. They will take longer to soften and it may be necessary to cook them separately. A little soda added to the water will help to soften them. It must be remembered that they have a higher mineral salt and vitamin value than the lighter-coloured inner ones.

Probably the best way to cook vegetables is to boil them provided this is done in the right way. The minimum amount of water (pan about one-third full) should be used. Have the water boiling and salt added before adding the vegetable. Add the latter gradually to prevent the water going off the boil. The lid should be on the pan and the cooking must not be prolonged beyond the time necessary to soften the vegetable. There will only be a small amount of liquid left but this will contain some of the mineral salts and vitamins, and so should be added to soups or used in some other way.

If the water is hard the calcium value of the vegetable is increased.

The old method of boiling vegetables in a pan full of water and pouring the water down the sink is severely condemned.

Another method, to which the name *conservancy* has been given, is to cut the vegetables into small pieces and cook them in a little stock till tender; when dished, reduce the remaining stock and pour it over them. They may also be cooked in

butter to which a very little water has been added, and this, too. should be served with the vegetables. By these methods none of the valuable alkaline salts are lost and the flavour is retained. Steaming vegetables is not a satisfactory method as much of the vitamin present is lost.

Serve the vegetables as soon as possible after cooking. It should not be necessary to keep them hot for long or to reheat them. Twice cooked vegetables are practically useless from a vitamin C point of view. Where they are being prepared in large quantities as in canteens, they should be done in relays so that they do not require to be kept hot for a long period. The longer a vegetable is kept after cooking the less vitamin does it contain.

The seasoning of food is of great importance in successful cooking ; it is sometimes impossible to judge individual tastes, but if one is in doubt it is always safer to under-season than to over-season.

Salads.—A French wit once said that Britishers have a religion for every day of the week but only one salad ; that, however, must have been a long time ago, for I scarcely think that anyone could justly accuse us now of having a want of variety in salads. The chief fault nowadays lies in their not being used often enough, and in their not always being regarded as an essential part of the diet. In spring and summer there is always a large variety of vegetables to be got ; winter is the season which brings some difficulty to the salad maker, but we should endeavour to make the best of what can be got, and it is useful to know that vegetables, fruit and nuts may be satisfactorily combined.

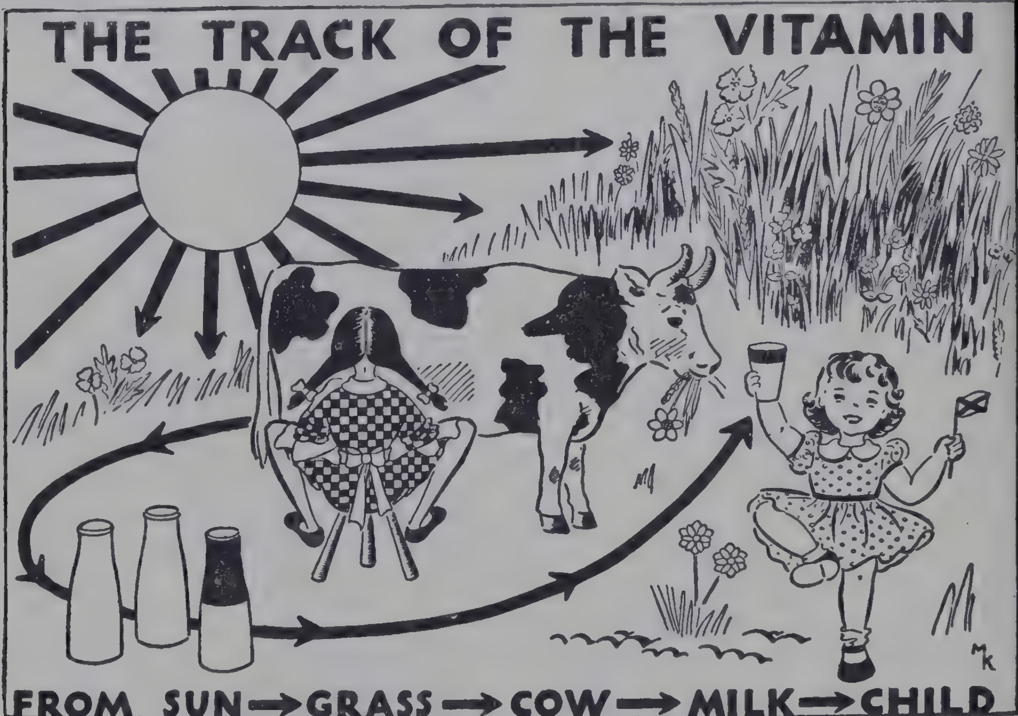
Lettuce is often used as foundation of a salad but it should be remembered that this has not a high vitamin C value, the leaves of cabbage being better in this respect. Tomatoes are a standby for salad making at all times of the year. Uncooked carrot is sometimes used in a salad but there is no special advantage of taking carrot in this form as there is not much

vitamin C in it to lose by cooking. It is a good source of vitamin A, but this is probably more thoroughly utilised in the body when the carrot is cooked.

Recent investigations show that vitamin A is more completely used if fat is present with it, and this explains the desirability of serving salad dressing, which may be made from salad oil and about half its bulk of vinegar—or better still—lemon juice.

Value of Fresh Foods.—It is impossible to overestimate the value of fresh foods. In Chapter I, it will be remembered, it was explained that in the presence of sunlight the green parts of plants are able to change carbon dioxide and water into starch, a chemical change which the chemist is unable to produce; some kind of vital force or energy is supplied by the sun to bring about the chemical combination and this energy is stored by the plant. It is a particular form of this vital force which is stored in the form we call vitamins. As we have learned, the plants can pass these vitamins on to the animals that feed on them, and thus we can regard all fresh foods such as milk, eggs, butter, fruit, salads, etc., as stores of this vital force—stored sunshine as we may call it. Over-refining and preserving of foods cause them to lose at least some of this important vital property, as well as robbing them of other nutritive qualities; a typical instance of this is the devitalising of cereals by the removal of the bran and germ. Vitamins in food may also be partly destroyed by drying, and the loss in value of a dehydrated food depends on which of these were present. Vitamins A, D and B_2 are not affected by the drying process but B_1 and C are partly destroyed. In vegetables, the chief loss is vitamin C, though, if the dried vegetable is carefully cooked it may have as much as a badly cooked fresh one. In the drying of milk there is a loss of vitamins B_1 and C. Fresh milk, however, is not an important source of these so the loss is not significant. In the case of dried eggs there is some loss of vitamin B_1 but otherwise they are similar in value to

fresh ones. In dehydrated meat the loss, again, is vitamin B_1. Foods of this type have a special importance in the diet during war-time owing to their being more easily transported, but in normal times the fresh ones are to be preferred. The loss of food value during canning has been much reduced in recent years by improved methods. If preserved foods are



THE IMPORTANCE OF SUN IN PRODUCTION OF VITAMINS.

used with discretion they will do no harm but unfortunately the tendency nowadays is to use them to excess and to let them usurp the place of fresh foods. The nation's health, without doubt, would show a vast improvement if we would only depend more on nature and base our diet on foods which have not had their health-giving properties destroyed by purification and preservation.

Excessive use of Sugar.—Another common fault of the diet to-day is the excessive use of sugar. Many children are taught the sweet-eating habit at a very early age, a sweet popped into

the mouth being regarded by a large number of mothers as the infallible way of stopping the baby's peevish cry. Sugar is certainly necessary for the child to supply the energy so much in demand, but excess is harmful, not the least of its unwanted legacies being a craving for sweet things. Many adults, also, consume too many sweets. A big proportion of the total number of calories required per day is provided by a single quarter of a pound of chocolates; the actual number is 628, approximately equivalent to the amount which would be provided by 7 eggs, 2 lbs. of white fish or 4 slices of bread.

Drinking of Water at Meals.—The desirability or otherwise of drinking water at meals is often the source of controversy. In some types of indigestion it is certainly not advisable to drink water with a meal, as it dilutes the gastric juice and decreases its action, making the food remain longer in the stomach. In other forms of indigestion the drinking of water may be quite beneficial, but it is only the doctor who, knowing the cause of the condition, can advise as to which is the best thing to do. For the ordinary person who is free from indigestion the best plan is to drink what one feels inclined for.

Faddisms.—As I have mentioned elsewhere, people are continually looking for what they think may be the *Elixir of Health* and often are ready followers of the numerous food faddists, such as those who advise one to eat nothing but apples one day each week, or to take six oranges a day, or to chew one's food once for every tooth, etc. Chewing is certainly important, but, like other things, it can be overdone, with the result that the food loses its flavour, a factor of much importance in its relation to digestion. Mr. Gladstone, who lived to be eighty-eight years of age, is said to have chewed his food thirty-two times for every mouthful, but perhaps he would have lived to be a hundred if he had not thought quite so much about it! Who knows?

Then we find quite unmerited guilt attributed to certain foods; some trifling coincidence may be enough to start the

idea and, as ill news travels fast, the libel may soon become widespread. For example, cancer has been attributed to the use of certain specified foods, though there seems to be no foundation whatever for the belief. On the other hand, the value of a particular food may be over-estimated, such as in the case of some of those I have referred to in the chapter on invalid diet.

It is very unwise to think too much about food and it can be confidently asserted that the nearest approach to the *elixir* is a diet composed of just enough—and not too much—of plain, wholesome, fresh, properly-cooked and daintily-served food, with the protective foods mentioned in Chapter II well represented.

CHAPTER XI

THE THRIFTY HOUSEWIFE. CHEAPEST FOODS NOT ALWAYS THE MOST ECONOMICAL

"To be honest, to be kind, to earn a little and to spend a little less."

ROBERT LOUIS STEVENSON

In the planning of the household diet in relation to expenditure it is essential that we distinguish between " true " and " false " economy. A diet consisting of the very cheapest foods to be got is not always an economical one, for unless the food is properly chosen we will probably have far more to pay in the end for doctors, medicine and other expenses incurred by illness; this, however, does not imply that to get a satisfactory diet we have to buy the dearest foods. The capable housewife, knowing something about what foods are made of, and having learned what the body needs, can use this knowledge to plan a diet which will be as cheap as the income demands and yet will supply all that the body requires for health.

The housewife should try to think in terms of the food substances rather than of the food itself—not how much bulk is being got for the money but how much protein, etc., it is going to provide.

Provision of Protein.—As we have learned, protein is a very important part of the diet and a dish in which animal protein forms the chief part should be included in two meals per day, but not necessarily oftener. The economy of herrings and cheese should be remembered in this connection, and the use of

the pulses—peas, beans and lentils—in supplementing these should also be kept in mind.

Where the housewife has constant difficulty in making ends meet, it will help matters greatly if the meat course in the dinner is sometimes replaced by some cheaper protein food. Taking 4 oz. of meat as being a typical helping, this would be approximately equivalent in protein content to the following suitable substitutes : 5 oz. of herrings, 3 oz. of cheese, $1\frac{1}{4}$ pints of milk, 5 oz. of nuts, $6\frac{1}{2}$ oz. of oatmeal or 4 oz. of pulses ; some of these foods may be used as a substitute for the meat or they may be utilised to make it go further—for example, as oatmeal balls, oatmeal and mince, haricot mutton, etc.

Provision of Fat.—Fat is another expensive but essential item to be provided. Here the housewife must recognise the false economy of bread and jam instead of bread and butter for children. The margarine, now on the market, has vitamins added to it and so is equivalent to butter in food value. Some time ago, when travelling in a train, I overheard a woman remark to a friend that all her children had grown up strong and healthy, and completely free from all except minor ailments, a happy state of affairs which she attributed partly to the fact that, though she had had to economise in many ways, she had "never spared the butter". Her philosophy was undoubtedly sound ; it is wise to economise on the things of least importance.

Value of Milk.—Milk is always a rather expensive item, but it fully justifies the money spent on it. If we consider a family of six children and allow for each child one pint per day—the minimum advised by the dietitian—and, say, half a pint each for the father and mother, the total would be seven pints, which at threepence a pint* would amount to 1/9 per day or 12/3 per week—an undoubtedly big part of a wage which allows perhaps only 25/- to 30/- to be spent on food. It must be kept in mind, however, that if a child is getting a fuller supply of milk,

* Pre-war price.

it does not require so much of the other expensive protein foods; and if the parents take advantage of the Government's milk scheme referred to in Chapter III, it will help them to provide the necessary amount of this most important of all foods.

The value of skim milk should be noted; it contains a great part of the constituents of whole milk and can be bought much more cheaply. In regard to eggs, the price always rises in times of scarcity but their great value ought not to be forgotten, and enough should be preserved during the plentiful season to tide over that part of the year when they are scarce.

Importance of Fruit.—Fruit must not be considered a luxury and if in the case of a large family the financial position renders it impossible to supply fruit in unrestricted quantity, it should be remembered that even half an orange is better than none at all.

Wise Spending.—It has been suggested that a good way of apportioning the money spent on food is to devote the same amount to (1) milk, butter and cheese, (2) meat and fish, (3) fruit and vegetables. From previous information we know that all three hold a very important place in the correct diet.

The thrifty housewife looks ahead and, considering the expenses she will have to meet, judiciously allots a suitable proportion of the available money to each, not forgetting a little to be laid aside for unforeseen needs or for *the rainy day*. If a man is earning £3 or £4 a week, about half of this should be spent on food. The housewife should keep an account of all that is spent, so that she can compare the expenditure from week to week. It is better when possible to pay ready money but if accounts are run up they should be paid regularly and not allowed to accumulate to such an extent that they form an overwhelming drain on the purse when the time for making payment arrives.

Meals should be planned a few days ahead so that one day can fit into another.

Great economy may be practised in the purchase and cooking of food, as a little consideration will prove. Small apples may

be selling at twopence per pound less than larger ones but, if half the weight of the small ones goes in the peel and core, it will be false economy to choose them in preference to the larger.

In the case of rabbit and fowl the thin ones are proportionately dearer, as the weight of bone is the same for any one size.

The amount of bone present must also be taken into account when purchasing meat and fish. The following comparisons for meat show how appreciably this affects the actual price :

	Percentage of Bone.	Price * per lb.	Cost of Meat alone.
Stewing steak	0	1/4	1/4 per lb.
Shoulder of mutton	15	1/2	1/4½ ,,
Flank of mutton	17	/10½	1/0½ ,,
Leg of mutton	13	1/6	1/8¾ ,,
Sirloin of beef	20	1/8	2/1 ,,
Chicken	30	1/3	1/9½ ,,
Rabbit	30	/8	/11½ ,,

From about 20 to 50 per cent. of the weight of fish is bone, and the relative economic value of the various kinds is seen from the following :

	Percentage of Bone.	Price * per lb.	Price of Nutritive part.
Herrings	30	/5	/7 per lb.
Salmon	23	3/-	3/10¾ ,,
Mackerel	50	/4	/8 ,,
Haddock	45	/8	1/2½ ,,
Cod	49	/10	1/7½ ,,

A cod's head makes very good stock for soup and there is quite an appreciable amount of flesh to be got from it despite the fact that it costs only about 2½d. Cod roe, when in season, forms a particularly nourishing and economical dish. Fish in

* These are pre-war prices but present prices show the same comparison.

general, however, with the exception of herrings, may be regarded as a dear food and should not find a very prominent place in the poor man's fare. In this connection, the old saying which has it that "when fish is bought it is only half bought" refers to the fact that butter, etc., in the form of sauce is required to complete the dish, thus increasing the price.

A sheep's head is an economical purchase as it costs only 10d. and gives, with the tongue and brains, fully a pound of meat; the stock got from it will form excellent broth for the other course of the meal.

Ox heart is usually cheap, and can be used alone or along with scraps of bacon and bread crumbs to make sausage roll.

Though it takes 1¼ lb. of tripe to give as much protein as 1 lb. of beef it can usually be bought very cheaply, and forms an economical and easily-digested dish. It requires long careful cooking and if this is not carried out the tripe will be tough and difficult to digest.

Foods which are not perishable are cheaper when bought in large quantities, and this should be carried out to as great an extent as storage accommodation allows. It should also be remembered that foods in their season are always at their best and are cheapest; but those which show the least sign of decay are not cheap however small the price. When purchasing food it is always better to choose it for yourself than to trust to the shopkeeper to choose it for you.

Economy in Cooking.—While the dearer cuts of meat are probably more easily cooked and can be served in a greater variety of ways, the cheaper cuts can, nevertheless, be just as nourishing if properly cooked. Stewing is the best method for these as, if this is carefully done, they can be made quite tender. Frying is suitable only for the better cuts, e.g. loin chops or the best steak, are suitable and even then the meat may be rather indigestible.

The liquid in which a food has been cooked often contains a considerable amount of nutriment. The careful housewife will

not throw this away but will use it for making soup, suitable additions to this being the liquid in which fish, meat or vegetables have been cooked, or in which rice or macaroni have been boiled.

Soup is an item which like porridge is taking a diminishing part in our national diet. In the interests of thrift as well as of health this is unfortunate, as in homes where there are many mouths to feed and not too much to do it on, the demands on the shallow purse can be appreciably cut down by the frequent preparation of a well-made pot of soup.

There is probably no other food on the market so much adulterated as jam and jelly ; one not only saves money but obtains a much better jam by making it at home. Economy is also effected by buying the fruit in the cheapest season. The dearer fruits have the property of imparting their flavour to others and a little rhubarb or gooseberry juice may be successfully added to strawberries, etc., to make them go further, without appreciably affecting the flavour of the jam.

No food should be wasted ; perishable things should be bought in quantities suitable for immediate use and any " left overs " should be used to the best advantage. Scraps of meat, fish and vegetables can all be made up into a variety of tasty dishes. Cold potatoes should be re-heated by frying, or mashed and used to re-dress meat and fish. Bread should be cut as required and any stale pieces may be made into a variety of bread puddings ; if the crumbs are added to flour in making a dumpling they will make it lighter and more digestible. Alternatively, they may be mixed with mince to make it go further or with milk, parsley and seasonings to make a stuffing for meat, etc. Scraps of bread may also be used for coating food ; for that purpose they should be dried slowly in the oven and then crushed with a rolling pin.

An astonishing amount may be got from the ends of cheese by grating and it can then be used with rice, macaroni, potatoes, etc. ; the outside part may be washed and added to soups

which are later to be sieved. Bacon rind can be used in the same way. Bones, instead of being thrown away, should be used for soup making; even when boiled a second time they will give material for stock. Gravy and sauces are useful for moistening re-dressed dishes.

Scraps of fat should be cut into pieces, put into a strong pan with a little salt and just enough water to cover them, and brought to the boil; any scum which rises to the top on boiling should be removed and the liquid allowed to simmer for about five hours, during which time the water will evaporate. If the fat is then strained and allowed to cool it will solidify into a cake of clarified fat which can be used for many purposes in cooking, viz. for frying, for soups and stews and for economical pastries and cakes. Surplus bacon fat should be kept separate and used for frying lean bacon or ham, or for making oatcakes.

Money may also be saved by home baking and any milk left over should be kept for this purpose. Home baked food is always appreciated and it can usually give the satisfaction of being made with the best ingredients.

Many, indeed, are the ways in which the housewife can economise wisely; a good housewife is always thrifty, takes a pride in being able to cook well, and realises the importance of her art to the happiness and wellbeing of the family.

CHAPTER XII

DIET IN SPECIAL CIRCUMSTANCES. HOW TO CATE FOR PEOPLE SUFFERING FROM INDIGESTIO RHEUMATISM AND OTHER AILMENTS AN CONDITIONS

> "The cure of disease by means of diet is the most wonderful part of medicine."
>
> CELSUS, about the year A.D. 30

CHOICE AND SERVING OF FOOD FOR INVALIDS

MOST people at some time or another are called upon to atten to the sick, and great responsibility lies with the person who is i charge of the planning, cooking and serving of the meals. N branch of cookery requires more care and thought than that fo the sick-room, and the recovery of the patient depends in n small degree on how it is done.

Careful attention should be paid to what the doctor advise and the food should be as fresh and of as good a quality as ca be procured. The appetite of a sick person is never of the best therefore no trouble should be spared in trying to tempt it. I the first place, everything should be served as daintily a possible for the reason mentioned in an earlier chapter. It i sometimes rather difficult to get variety where the diet is re stricted, but one must endeavour to procure this even though i is only in the method of serving. Those things which are mean to be served hot should always be hot and cold dishes should b really cold. Small helpings should be given, as the sight of a large quantity of food, when the patient is not feeling ver hungry, will often drive away any inclination there is for a meal

for the same reason, food should not be prepared within view of the patient and it is better that he should not know what he is going to have. Meals should be served punctually; the nerves of a sick person are usually easily ruffled and if the food does not come at the time it is expected the irritation so caused may result in a considerable cutting down of that supply of appetite juice which is so necessary.

There are some foods which are specially associated with the sickroom and it is well to know something about their value.

Meat Extracts.—The many attractive advertisements written about these may delude people into a false idea as to their worth. Although they impart a feeling of wellbeing by stimulating the appetite and digestion, they have little real nutritive value; it has sometimes been said that they do not make us strong but make us aware of our strength. A full teaspoonful of one of the best-known brands contains only about the same amount of protein as a fifth of one ounce of meat. They contain some vitamin B.

Meat juices are rather better, for although the amount of protein in them is also small it is in an uncoagulated form and easily made use of. The value of home-made beef tea depends a good deal on how it is made, but even at the best we should not count very much on its food value, though the extractives in it are useful as a digestive stimulant. Clear soup has a similar value and effect.

Marmite.—This is an extract prepared from yeast. It resembles the meat extracts very much in taste but has probably not quite such a stimulating effect; it is a rich source of vitamin B.

Jellies.—Some people imagine that jellies, especially calf's foot jelly, are exceedingly nourishing for invalids, but while they have their use in the sickroom diet they do not really supply very much nourishment. The chief constituent is gelatine and their chief value lies in their being cool and acceptable to the invalid. If eggs or milk are used in their preparation, of course, they may then be very nourishing.

Glucose.—This is a sugar which requires no digestion, as it is in the form in which it can be immediately absorbed into the blood. Being less sweet than cane sugar, it can be added to fruit drinks to a comparatively large extent, thereby increasing the caloric value of the drink. Glucose can be very quickly used as fuel in the body and is useful in fevers, in helping to prevent the destruction of tissue by providing material for combustion ; it also prevents acidosis, which often occurs when the diet is reduced.

Milk.—Milk is of great value in the sickroom and one need only think of the large quantities used daily in our hospitals to realise its importance in restoring the patient to health and strength.

The ease with which milk is digested depends a good deal on the individual, but if there is any difficulty in this respect there are various ways of treating it so as to make it more readily tolerated. Diluting it with water is all that is required in some cases. Peptonising powders may be used to digest it partly or something may be added to make softer and more digestible the curd which forms when the milk enters the stomach ; this curd would not form at all if it were not for the presence of the soluble calcium salts which occur in the milk, and if a little sodium or potassium citrate is added, it renders these soluble salts insoluble and thus prevents the formation of curd. About one grain of citrate should be added for every ounce of milk. Barley water may also be used for this purpose ; it does not prevent the formation of the curd but it keeps it softer. Cooked cornflour and oatflour have a similar effect. Acid makes the curd shrink and become tough, so if a little baking soda—which is an alkaline substance—is added it will destroy some of the acid in the gastric juice and increase the digestibility of the milk.

Milk is easily absorbed and puts very little work on the intestine ; it is for this reason, and also owing to the fact that it helps to prevent putrefaction, that it is sometimes used in intestinal diseases.

Eggs.—These are also invaluable in the sickroom, being particularly nourishing and easily digested, and capable of being served in a variety of ways. It adds greatly to the problem of dieting when, owing to the idiosyncracies referred to in a previous chapter, the patient is unable to take them.

Ices.—These are frequently used in invalid diet ; they can be very nourishing, and when circumstances permit them to be given they are usually greatly appreciated.

SPECIAL DIETS

The subject of diet in disease is a vast one, but much of it lies in the domain of the medical practitioner or hospital dietitian and is, therefore, beyond the scope of this book. There are, however, some more or less common ailments that most of us have at some time or other to contend with on our road through life, and it is well that we should know something about the dietary treatment most suited to these when they are encountered.

Indigestion.—One of the most common ailments met with today is indigestion ; it is very often caused by faults in the diet, for example, excess of fat or sugar, or the consumption of more food than is required for the general needs of nutrition. Tiredness, worry and a general want of tone in the organs will also lead to it. In indigestion the sufferer is unable to digest an adequate amount of food and the weight becomes less, the whole body developing a condition similar to that brought on by starvation.

Indigestion is usually associated with some abnormality in the composition of the gastric juice ; for example, in **Hyperchlorhydria** there is an excess of hydrochloric acid—this giving rise to pain or discomfort. The acid irritates the delicate lining of the stomach, causing it to become inflamed. The condition is one which can be relieved considerably by choosing a suitable diet and here our knowledge of the chemistry of proteins comes most usefully to our aid. When an acid and a

protein unite they form a compound called meta-protein; when this is formed the acid is no longer free to cause the irritation, and the diet should therefore contain a full supply of easily-digested protein foods such as milk, eggs, white fish, etc. Soups, red meats, gravies and meat extracts should all be avoided, because the extractives in them encourage the flow of gastric juice and hence increase the amount of acid. Fat inhibits the secretion of juice and should accordingly be included in the diet, though only in an easily-digested form, e.g., unsalted butter, cream or olive oil. Fried foods, however, should not be taken.

In a normal condition most of the action of the saliva goes on after the food has passed down into the stomach, but when there is an excess of acid there the alkaline salts are soon neutralised and—the saliva remaining inactive owing to the absence of alkaline substances—the digestion of carbohydrate is interfered with. Lying undigested in the stomach, it ferments and causes flatulence; for this reason, the amount of carbohydrate foods must be restricted. Potatoes and cane sugar are specially liable to ferment and should be avoided. The pudding course of the dinner should be chosen from such things as custard (made with egg and not powder), jellies, junket, ice-cream, apple snow, sieved prunes, etc., these having little or no carbohydrate.

Food should be given rather dry but fluid should be taken frequently between meals. All pickles and highly seasoned dishes should be avoided. Excess of salt is specially harmful; being a chloride, it helps to form hydrochloric acid. Vegetables, with the exception of cabbage and onions, should be introduced into the diet each day if possible; if thoroughly cooked and finely sieved, they should have no ill effects. Food should not be served either very hot or very cold, as both extremes induce acidity. A feeling of hunger commonly accompanies the condition, but it can be prevented, up to a point, by giving food in small quantities more frequently during the day than at the regular meal times.

The opposite condition—where there is too little hydrochloric acid in the gastric juice—is another type of indigestion ; it is not quite so common as the one I have just described and is known as **Hypochlorhydria.** It may occur alone but is frequently found accompanying more serious diseases. As one of the important functions of acid in the stomach is the part it plays in destroying bacteria, fermentation with resultant flatulence is apt to occur in this condition also, thereby rendering it difficult for the individual, unless he consults a doctor, to tell what type of indigestion he is suffering from ; it is most important that he should know, as the respective diets for the two types are totally different. A certain amount of hydrochloric acid is essential in the gastric juice, as it plays a big part in converting the protein foods into a condition capable of being acted on by the ferments of digestion, and if the amount of hydrochloric acid in the gastric juice is deficient, digestion will be impaired. The diet can help greatly in increasing the amount of acid secreted ; it should include the usual light forms of food, served as appetisingly as possible and introducing in moderation those things which excite secretion of gastric juice, e.g., seasonings, meat extract, etc. Since hydrochloric acid is required for the digestion of proteins it follows that the amount of protein should be reduced to a minimum and that the protein foods given should be as easy to digest as possible, viz., eggs, milk, mild types of cheese, white fish and white meat.

Soups containing extractives are excellent and sieved vegetables can usually be taken without discomfort. Carbohydrates may be given, but it is better to avoid those which ferment readily, viz., potatoes and sugar. As one would expect, the acid juice of fruits is distinctly beneficial.

Fats must be drastically reduced from the amount taken in a normal diet and even the easily-digested ones, viz., butter and cream, should be restricted in quantity. All fried foods, pastry and other foods rich in fat should be strictly avoided.

Food should be thoroughly chewed, as this stimulates the secretion of gastric juice.

Owing to the weakening of the forces acting against bacteria and the consequent danger of bacterial trouble both in the stomach and, further on, in the intestine, it is advisable to see that the chance of introducing such organisms in food should be reduced as far as possible by paying particular attention to the cleanness and freshness of all foods.

While indigestion is most frequently due to the stomach it is sometimes the liver which causes it, as is the case in **Biliousness.** The liver is a very busy organ. It has to change the newly-absorbed sugar, which has been brought to it, into a substance called glycogen ; this is stored in the liver cells and is gradually rechanged into glucose and passed into the blood when the supply of sugar there is used up by the demand for energy. The liver has also to get rid of a certain amount of waste matter. We can thus well understand the unhappy feelings of the liverish individual and the apposite saying that, "Whether life is worth living depends on the liver."

In a bilious attack—indicating that the liver is not able to carry out the work it is called upon to perform—the obvious thing to do is to give it a rest, and a diet reduced almost to starvation point will probably allow it to recover. The diet should then be very gradually brought back to normal, giving white meat, fish, lightly-cooked egg, stewed fruit and well-cooked cereals. The amount of fat should be restricted and all greasy foods avoided. Sugar also should be reduced.

Rheumatism.—No very definite rules of dieting can be given with regard to this, as types of rheumatism vary in different cases, the nature of the particular diet depending on the type and also on the condition of the individual patient. In general, a nourishing diet is called for with plenty of vitamins and alkaline salts such as are found in milk, fruit and vegetables. In some cases it may be necessary to avoid foods which produce uric acid such as liver, sweetbread, etc. Easily-digested foods

are to be preferred. All pastry and fried, highly-seasoned or salted foods should be avoided, as also much sugar. No alcohol whatever should be taken, but plenty of water should be drunk between meals.

Constipation.—Any doctor will admit, if questioned on the point, that the majority of his patients suffer from constipation, and also that if they are cured of this it is usually an important step in effecting a cure of their illness. When food reaches the large intestine the part which is of use to the body has been absorbed into the blood, and it is the unabsorbable part which is of no use to the body that is passed on here to be excreted. This should take place at least once in twenty-four hours, otherwise the large intestine becomes a great source of toxic substances which poison the system and cause many serious diseases or general ill-health.

Constipation is largely a habit and is the more difficult to cure the longer it is allowed to go on; it is good to know, however, that even the severest cases can usually be cured by careful dieting. If the habit of taking medicines is established the bowel becomes accustomed to the artificial stimulation and will not act without it. Many of these medicines act by irritating the mucous membrane and causing it to produce water, just as the eye waters when irritated; naturally, such continued irritation is not to be recommended.

The proper functioning of the bowel depends largely on the amount of unabsorbable material which has passed into it, this stimulating the muscles of its walls to contract. Foods rich in roughage should therefore form the basis of the diet, viz., fruit, vegetables, nuts and whole grain cereals. Foods containing vitamin B are helpful, the preparation known as Bemax being specially rich in this vitamin. Fats and oils of all kinds are excellent, such as butter, salad oil, fat bacon, etc.

Apples, prunes, oranges, spinach, marmalade, honey, treacle and treacle-containing foods are also beneficial. Fruit is specially effective if taken before breakfast.

A drink of water half an hour before meals is helpful and plenty of exercise is essential.

Milk and eggs are absorbed to such an extent that they do not produce much residue or roughage and therefore should not form too great a part of the diet. Strong tea and coffee and much butcher meat should also be avoided.

The Common Cold.—The most widespread malady of all is the common cold. Though there are many so-called cures there is probably no real one and the cold has usually to run its course; we can, however, do much to mitigate its severity and prevent more serious complications arising, and diet is an important factor in achieving this. Incidentally, we must not assign a wrong meaning to the saying, "Feed a cold and starve a fever." The "moral" of the saying is that if we continue to take the normal amount of food when we have a cold we will, in all probability, be forced later to starve owing to the development of a feverish condition.

A severe cold usually affects the whole body; not only does one have a tired, listless feeling but all the organs of the body are really feeling tired and not in a fit state to perform their normal work. The natural treatment is therefore to give them a rest by cutting down the amount of food and taking only those things which give little work to the digestive organs. It is advisable to drink plenty of fluids, as these help to get rid of the poisons being produced; a hot lemon drink is particularly effective towards this end. When the symptoms have gone, the diet should be gradually brought back to normal. Many people resign themselves to having a series of colds during the cold wet sunless days of the year, but we can do a great deal to prevent their onset by attending to our diet during autumn and winter and eating plenty of vitamin A foods and fat-rich foods.

Diet in Fevers.—Fever is a condition which accompanies many forms of illness. It is a manifestation of the efforts being made by the body to overcome the attack of some disease and results in an increase in the activity of various organs.

A patient with a high temperature has no inclination for food, and though very little need be given during the height of the fever it is not good to continue the starvation too long, as the body loses its strength, with a consequent reduction of its power to combat the disease ; in addition, the tendency to acidosis is increased. The principle of dieting is to give as much nourishment as the weak state of the digestive organs will allow, and this only in a very easily-digested form. A certain amount of protein is essential owing to the extra destruction of tissue, but we must guard against giving too much of this owing to the weakened state of the kidneys. The digestion of fat is greatly interfered with in a fevered condition of the body, so it should be withheld, except in easily-digested forms such as milk. If the temperature is 102°F. or higher, the diet should be fluid. There are several reasons for this—namely, fluid foods are more easily digested and are more acceptable to the patient, who finds the swallowing of solids difficult owing to the parched condition of the mouth and the want of saliva ; it helps to restore water to the tissues, which have been dried up by the fever ; it helps to allay the thirst and helps to get rid of the toxins produced by the fever. Sometimes nothing but milk is given and then it is best to give it frequently, in small quantities ; the patient should be told to sip it very slowly.

Other things which may advisedly be included in a fluid diet are beef tea, jellies, fruit drinks, chicken broth, gruel and invalid foods such as Benger's. These also should be taken often, but very little at a time.

The only thing a fevered patient really feels inclined for is water and there is not, as a rule, any reason why this should be restricted, but it is most important that it should be sipped slowly ; there is great danger in taking big draughts of cold water when the temperature is high. A little lemon juice amongst the water will help to quench the thirst. After the restricted diet, the return to a normal one should be very gradual.

Diet in Old Age.—The postponement of the various troubles so often associated with old age—dyspepsia, rheumatism, etc.—lies partly in our own hands. Much depends on the regulating of the diet to the changing needs of the body; this, when properly carried out, exerts a wonderful recuperative influence even in cases where people are far beyond the allotted span.

The commonest fault in dieting in later life is over-eating. Reduced power for activity, bad eyesight, etc., tend to make the time hang rather heavily on an old person's hands and meals are often the chief events of the day. In addition, many old people think that by continuing to eat as much as they did in their younger days they are helping to keep up their waning strength. On the contrary, being less active, they do not require so much food and an excess simply puts an extra strain on the weakened digestive organs and hastens the weakening of the tissues and the hardening of the arteries; in this connection, it is well to remember the saying about a person being "as old as his arteries".

The needs of an old person are very similar to those of a child. It is essential that the total amount of food should be gradually reduced, this applying particularly to protein foods, for these put a tax on the kidneys at a time when they are usually less able for work. Meat should not be taken more than once a day, and all foods in the diet should be of the easily-digested type as the general strength of the digestive organs has materially decreased. Light carbohydrate foods are suitable, but it is better to avoid an excess of the kind which ferment readily, such as sugar and sweets. Fruit and vegetables are in many cases avoided, from an idea that they cause flatulence, but this abstention is unwise, for the blood is just as much in need of their salts and the body as much in need of vitamins as in earlier years. It may be necessary to sieve vegetables and to give only the juice of fruit or to cook it.

Many old people do not sleep very well and something warm

but light, e.g., Benger's food, etc., just before going to bed, will help to counteract this tendency.

It is well to remember that rust is often more harmful than wear and as much exercise as possible should be taken ; it is important, however, to avoid becoming overtired. One should try, above all, not to make aged people conscious of their failing powers by giving help where it is not necessary ; there is no real cause for treating them as invalids.

Statistics show that there are great differences in the diet habits of those who have lived to be a hundred or over it, but one point which is stressed in nearly all cases is the value of eating plain foods in strict moderation.

Reducing Diets.—Nobody likes to be too fat and yet the condition is often due to bad habits, viz., taking more food than is required for the needs of the body, and taking insufficient exercise to use up the energy it is capable of producing. On the other hand, stoutness is occasionally due to disease, caused by the improper functioning of the internal secreting glands.

Something more serious than mere discomfort may result from excess of fat, for, when it collects round some of the internal organs, such as the heart, it can cause real interference with their work. The foods which most readily form fat in the body are fats and carbohydrates ; in a reducing diet, therefore, the supply of these has to be cut down and as much exercise as possible should be taken so that the body has to draw on its supply of stored fat to produce the necessary energy. Fried foods, cream, fat meat, rich soup, sauces, sweets and jam should be cut out of the diet. Skim milk may be substituted for whole milk and very little butter and sugar should be taken. Wholemeal bread is better than white but not more than three thin slices should be taken per day. Potatoes do not produce fat to the extent that was once attributed to them, but it is well to use them sparingly, nevertheless, for they are fairly rich in carbohydrate. Green vegetables should be taken in preference to other kinds of vegetables as they have little carbohydrate, and the large

amount of cellulose they contain helps to prevent the feeling of being starved which is likely to accompany a reducing diet.

There is no special need to reduce protein, and the necessary vitamins and mineral salts must be present though the diet is reduced.

EXTREMES OF DIET SHOULD BE AVOIDED.

The diagram shows stages of ill-health which may result when these are used without discretion.

The amount of fluid taken should be kept in moderation, especially if there is œdema (retention of water in the tissues), and salt also should be restricted in this case.

Drastic reductions in diet must be carefully regulated and should be resorted to only under the supervision of a doctor or other competent person. The present-day craze for slimming is responsible for many people cutting down their diet when such reduction is not naturally demanded ; this may lead to very serious results as the body, losing its vitality, has little resistance

to offer to the attack of disease. Convincing proof of this was got during the Great War and the years succeeding it when influenza, anæmia, nervous illnesses, etc., were very prevalent owing to the difficulty that had been experienced in procuring the foods necessary for the proper nutrition of the body.

Some people are naturally fat and some naturally thin, and where the conditions are not excessive and the general health is good, nature should be left alone and no attempt made to interfere with it by cutting down the normal diet. The patent preparations and drugs which are offered for sale as useful for slimming should never be taken unless by a doctor's advice.

Fattening Diet.—This is required when the body is below the normal weight, a condition which is common after a serious illness; underweight may also be due to neurasthenia or to tubercular disease. The diet must aim not only at supplying enough of the food substances for the requirements of the body, but also at providing an excess which can be laid up as a store of energy in the form of fat. Fat, carbohydrate and protein can all form fat in the body and therefore there should be a general increase of food over the amount taken in the normal diet. Fat is the most important addition, however, and the easily digested forms of it, e.g., butter, cream and eggs should be used as largely as the appetite and digestion of the patient will allow.

If there is wasting of the tissues, as there is in tuberculosis, there is a special demand for protein, and plenty of vitamins are necessary to ensure that this will be properly utilised. A switched raw egg is of much value as it is almost completely absorbed; it may be given between meals and will supply protein, fat and vitamins, and add considerably to the Calorie value of the diet.

As an increased diet may disturb the digestion the most easily digested foods should be chosen, and there should be as much variety as possible to stimulate the appetite. It does more harm than good to stuff the patient beyond the capacity of the digestive powers, but the increase will be tolerated more easily if it is brought about very gradually.

Anæmia.—In this disease the blood is impoverished and there is a general weakening of the body. In the less serious type, known as "secondary anæmia", the diet must be a liberal one with a sufficient amount of iron-rich foods such as liver, red meat, yolk of egg, pulses, oatmeal, watercress and other green vegetables. In severe cases, however, where there are sickness and gastric symptoms, care must be taken to give easily digested foods.

Liver is one of the best foods for enriching the blood. The active principle formed from the intrinsic and extrinsic factors referred to on page 68 seems to be stored in this organ.

Beef and mutton are also rich in iron but unfortunately the compounds in which it occurs are not well absorbed and, though they can form part of the diet, they are not quite so useful as might be expected. Milk, on the other hand, is deficient in iron but what is there is well made use of and so it may be included in an anæmia diet.

Pernicious anæmia is the most serious type and it is not very long since it was regarded as being practically incurable. This is not so, however, since the value of what is called a "liver diet" has been discovered. Usually half a pound of liver per day is given at first, but the quantity may be reduced as the condition of the blood improves. It may be given either raw or cooked; the raw liver* should be minced and put into sandwiches or the juice may be extracted and served in a red glass. Liver extracts in various forms may also be bought from the chemist. The diet should have plenty of vegetables and fruit and those iron-rich foods already mentioned. The condition known as hypochlorhydria, where there is a deficiency of acid in the stomach, invariably occurs in pernicious anæmia and a preparation of hydrochloric acid is usually ordered by the doctor; as already mentioned in the diet for this condition, the amount of fat should be restricted.

* Injections of liver extract may be given to avoid giving very large quantities by the mouth.

Diet during Pregnancy.—Since the expectant mother has to provide material for building up the tissues and maintaining life in the child, as well as to safeguard her own bodily needs, it follows that the diet at this time requires special attention. While there is no need to overfeed, with the resultant risk of digestive troubles, the diet must be adequate, and carefully chosen. As can well be understood, protein is of much importance and the best type of protein foods, viz., milk and eggs, should figure largely in the diet ; at least a pint of milk should be taken each day. Meat is also beneficial but it is better not to take it more than once a day, for fear of overtaxing the kidneys which have extra work to do and may consequently be weakened. Pickles and anything highly seasoned should be avoided.

It is desirable to have an increased amount of calcium and phosphorus in the diet, and the milk and eggs already mentioned will help towards this end. An insufficiency of calcium in the mother's diet is often the cause of weak easily-decayed teeth in the child ; X-Ray photographs show that even at birth not only the milk teeth but also the permanent set is beginning to form within the gums. The demand for calcium is shown also by the tendency there is for the mother's teeth to go, which brings to mind the old saying, " For every child a tooth." This need not be so, however, if the diet is well attended to and the necessary calcium supplied.

Constipation is an almost universal condition during pregnancy and serious complications may arise from it. It should be guarded against by taking an ample supply of roughage foods such as wholemeal bread and vegetables, provided they do not give rise to indigestion and excessive flatulence.

Vitamins are very necessary, especially vitamin D, because of the part it has to play in bone formation, and also vitamin A, because of its power of promoting growth and increasing resistance to disease ; there is a special liability to infection during pregnancy. Fruits of all kinds are excellent and these along

with the foods already mentioned, viz., wholemeal bread, milk, eggs and green vegetables, will supply the necessary vitamins.

The mother will probably find that she is able to take more nourishment if she has smaller meals than usual and takes them oftener than normally, and such a course should be adopted. Plenty of fluid should be present in the diet, for this prevents constipation and also helps the kidneys to expel the toxins which are produced at this time ; cold or warm water, lemonade, barley water, etc., should be drunk freely but liquids containing alcohol should on no account be included. The greater part of the liquids should be taken not at meals but between them, to prevent the flatulence which frequently occurs. Tea should be weak and the quantity consumed should be in moderation.

Rickets.—This disease occurs mostly among children though adults on a very poor diet may develop a somewhat similar condition. The disease is specially one of the bones though the muscles, nerves and other parts of the body are also affected by it. The dietetic treatment is to avoid excess of carbohydrate and give a well balanced diet containing first class protein, bone-forming salts and fats containing vitamins A and D. Cod-liver oil or some of the vitamin D concentrates should be given. Milk, cream, butter and eggs must have a prominent place in the diet. Exercise in the open air and hygienic conditions in the home are also of much importance.

CHAPTER XIII

VEGETARIANISM VERSUS A MIXED DIET

"The bounteous housewife Nature on each bush lays her full mess before you."

SHAKESPEARE

If we look for the centre which dominates all organic life, we find that all roads lead to the plant cell with its green chlorophyll or colouring matter. Through its agency, inorganic substances are rendered organic and made capable of supporting life in the plants themselves and in the animals which feed on them; so, in turn, they contribute to the maintenance of life in human beings.

Since we are dependent in the first place on the vegetable kingdom for our supply of food, the question arises—Is this source sufficient to supply all our needs, and is a vegetarian diet advisable or otherwise?

In some of its phases vegetarianism might be most appropriately dealt with under the heading of diet faddisms, but I have purposely omitted it from that section of the book for its adequacy as a form of diet depends greatly on the degree to which it is carried out. There are two classes of vegetarians—(1) Those who take no animal food of any kind; and (2) Those who take what is called a lactovegetarian diet.

Concerning the first class, total abstinence from all animal foods cannot fail to be unsatisfactory from the point of view of nutrition. The chief difficulty of such a diet lies in getting enough protein; but even when there is a sufficient amount of this, it is not the best type for body repair, and, in addition,

the protein of vegetable foods is usually accompanied by large quantities of starch and cellulose. Cellulose forms the framework of these foods and some idea of its nature may be got by considering a skeleton leaf, where all the constituents of the leaf except the cellulose have decayed; it can be understood that such a substance will offer decided resistance to the action of the digestive juices; it is not digested at all, as a matter of fact, except when found in very young vegetables, where it is softer and less tough. Owing to the presence of cellulose and the fact that vegetable foods absorb water and become more bulky when cooked, it is found that to get enough protein a very large quantity of food has to be consumed; the stomach, consequently, is filled as full as it will hold at every meal and this may lead to its becoming enlarged without the amount of the digestive ferments being correspondingly increased. The largeness of the quantity of food consumed puts extra work on the muscles which have to move it along the alimentary tract, and so other parts of the body may be deprived of their full share of energy.

The balance of the diet is likely to be at fault, with an excess of carbohydrate in proportion to the amount of protein present. There is also a lack of savour and of the variety of flavour which are to be got from animal foods, and the continual nut and lentil substitutes for meat are apt to become monotonous, with a psychological effect on the amount of appetite juice secreted. Large amounts of nuts and lentils, moreover, demand a fairly active life and are not at all suited for the sedentary worker.

With a lactovegetarian diet the same results are not so likely to occur, as eggs, milk and cheese are more concentrated forms of protein and of a higher biological value. Even with these foods included, however, there is very likely to be a shortage of protein and it requires considerable care and a good knowledge of the composition of foods to be able to plan a satisfactory diet.

Comparison with Mixed Diet.—Some people maintain that after changing over to a vegetarian diet they have enjoyed much

better health ; this is probably quite true as there are certain conditions—for example, a rheumatic tendency—which may benefit by a properly-planned vegetarian diet. The results of research on the subject, however, generally agree that as long as the health is good all is well, but that in a serious illness which saps the strength the person who has been accustomed to taking little protein will have less endurance, and will be less able to digest the quantities of protein required to renew the wasted tissues ; recovery will thereby be retarded.

The amount of protein consumed in different parts of the world varies greatly and the body seems gradually to adapt the functioning of its organs to the long-continued diet habits of the people. A study of the different races shows that great strength is often associated with those who are almost entirely flesh eaters, e.g., American Indians, and yet we also have instances of splendid physique among people who are largely vegetarian in their diet, such as Arabs.

In this connection, it is interesting to note that, if the length of the alimentary canal in an animal which lives on vegetable foods alone, e.g., the sheep, is measured, it is found to be proportionately longer than that of an animal, such as the cat, which is a flesh eater ; the respective lengths, of course, are suited to the relative bulk of the two types of food. In man the length is intermediate, which points to the fact that Nature intended him to live on a mixed diet. In relation to climate and other conditions in this country, it would seem that that is the form which is most generally satisfactory.

From the point of view of economy, vegetarianism probably scores as far as the actual money spent in purchasing food is concerned, but against this must be placed the extra fuel that is required to soften the hard cellulose and cook the starch of vegetable foods.

CHAPTER XIV

MICROBES. THE DANGER OF UNHYGIENIC HANDLING OF FOODS BEFORE AND AFTER REACHING THE HOME

"You have raised the veil which for centuries has covered the origin of infectious diseases. You have discovered and proved that they are caused by germs."

LORD LISTER to LOUIS PASTEUR

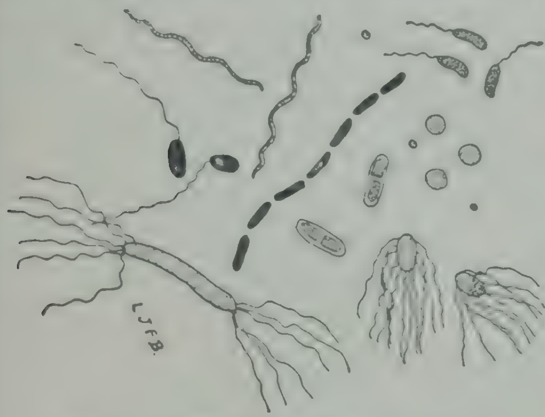
THIS chapter leads us to consider the inhabitants of that great world of unseen life—the world of microbes; these surround us on all sides and are ever ready to attack our food, producing changes in it which may seriously affect our health. The name micro-organism or microbe has been given to them for the reason that they are so small that they cannot be seen without the aid of a microscope. They may be divided into three groups: (1) bacteria; (2) yeasts; and (3) moulds. When

HOW BACTERIA MULTIPLY.

they decompose protein or fat we call the process putrefaction; when they decompose carbohydrate we call it fermentation. The former change is the most likely to be harmful, but to understand how they attack our food, it is necessary first to know a little about their needs and habits.

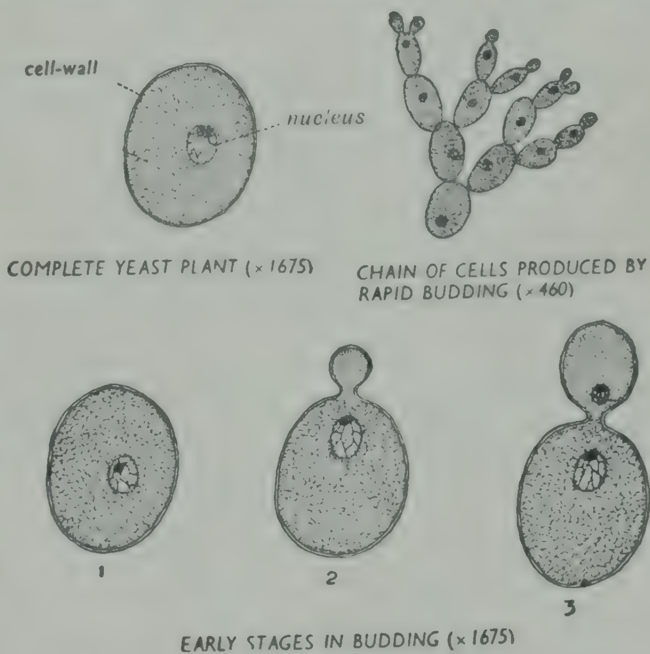
Bacteria.—Bacteria are small uni-cellular organisms which can increase very rapidly in a very simple manner, the cell dividing into two and sometimes into four; each part grows

until it is mature and then it divides in a similar way. Provided they get suitable conditions, viz., moisture and warmth, bacteria can increase at an enormous rate in this way, and one bacterium might at the end of a day have about sixteen million descendants. Fortunately, they do not actually multiply at such a rate, as many of them perish, but nevertheless they increase all too quickly. The chief things which prevent their growth are acid, low temperatures and strong solutions of sugar or salt; very high temperatures have the effect of killing them outright.



Various Forms of Bacteria.

Some bacteria have the power of producing spores, that is, they turn into small round bodies able to withstand adverse conditions of heat and cold much better than the bacteria themselves, and consequently are considerably more difficult to kill. Most bacteria require oxygen but some can exist without it.

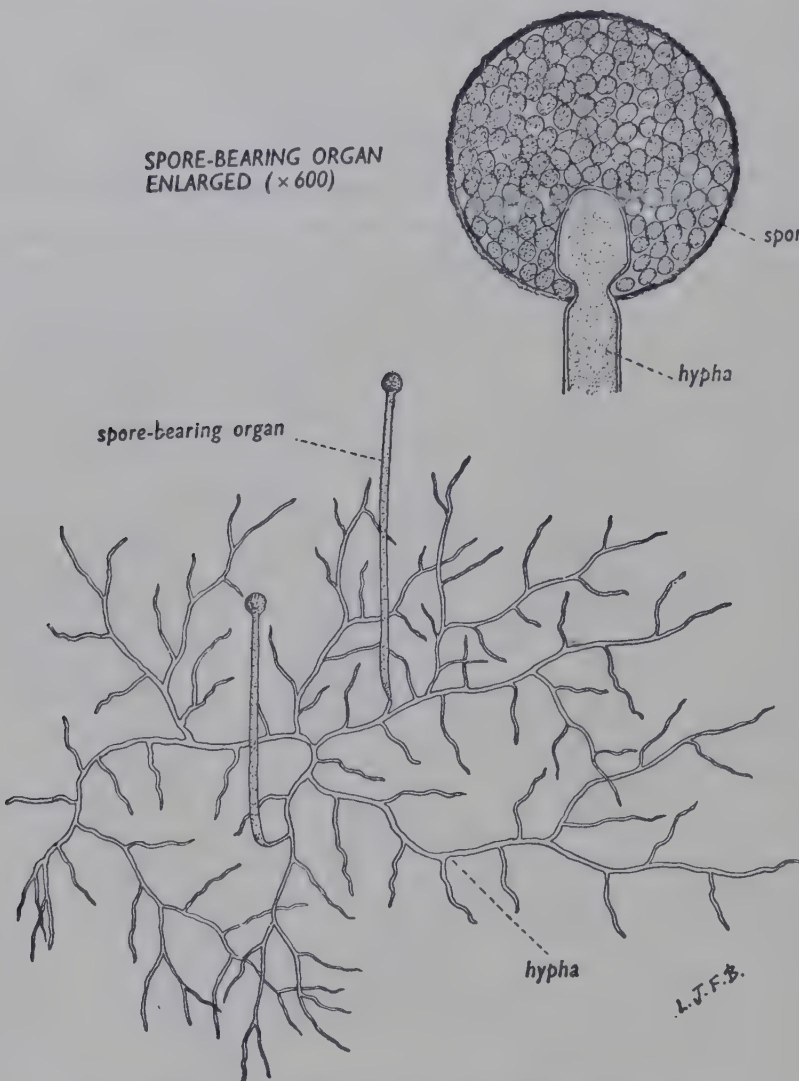


The Yeast Cell and how it Multiplies.

Yeasts.—These resemble bacteria in being small uni-cellular

M.F.F.

plants consisting of a little piece of protoplasm with a denser part in the centre called the nucleus. They are oval in shape

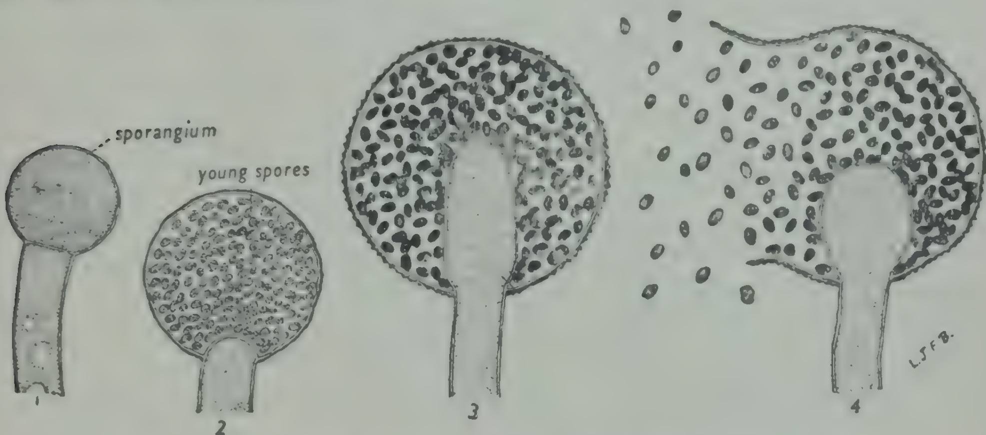


MYCELIUM OF MOULD SHOWING TWO SPORANGIA.
Above—A sporangium enlarged.

and are so small that about two thousand of them could lie in a row in the space of an inch, yet they are giants in size compared with some bacteria. They multiply in a different way—a small

bud arising from a cell, growing larger, and eventually separating as an independent plant.

Yeasts do not require so much moisture as bacteria, can flourish in the presence of acid, and can stand a greater quantity of sugar than bacteria—in fact, sugar is their favourite diet. Heat and cold affect them in the same way as bacteria are affected. Yeast contains protein of very high value and a special type is now being grown to be incorporated in foods and so add to their value.



STAGES IN THE DEVELOPMENT OF A SPORANGIUM OF MOULD AND SCATTERING OF SPORES.

Moulds.—This type of plant consists of a network of branching threads called a *mycelium*. These threads or *hyphae* spread themselves out in all directions through the food, and here and there a stalk arises with a round head or *sporangium* at the top of it bearing thousands of minute spores ; these correspond to the seeds of higher plants and they are able to form new plants when the sporangium bursts and they fall on a place suitable for their growth. Moulds are not so harmful as bacteria, though they are liable to cause trouble in the digestive tract and a food into which a mould has penetrated is no longer fit for use. Moulds are not so much affected by acids and by salt as bacteria or yeasts and, though requiring moisture, they can do with less of this than the other two.

Mould spores, yeasts and bacteria are all likely to be pres dust, and so pantries and all other places where food is s should be kept as clean and dry as possible. Some bacteri live without oxygen but yeasts and moulds cannot.

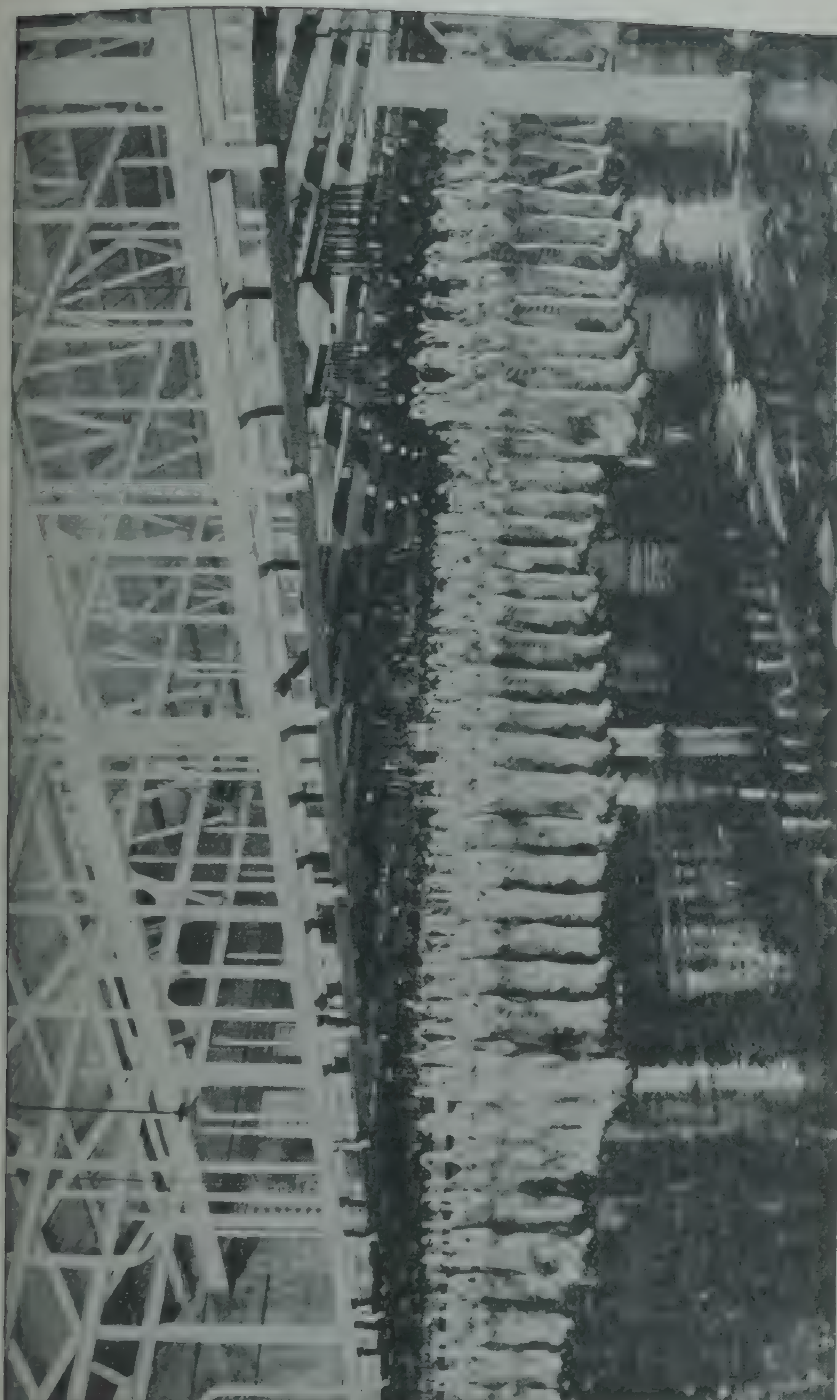
PRESERVATION OF FOOD

All the above points have to be taken into account in tecting our food against these organisms. The common me of doing this are: (1) by cold; (2) by heat; (3) by dry and (4) by the use of chemicals or other substances which in their growth.

Preservation by Cold.—This is the most satisfactory me of preserving if properly carried out, for nothing that mig harmful is added to the food and its nutritive and dige qualities are not affected to any appreciable extent. Cold not actually kill the organisms but it prevents their growing multiplying; they do not grow readily under 50° F. and cannot possibly grow if the food is frozen, owing to the ab of moisture.

This fact has a great significance in the matter of the na food supply, as by means of refrigeration perishable food be brought long distances, a course which would be quit possible otherwise. It also enables fish, the supply of v varies according to weather conditions, etc., to be stored they are plentiful, and so to form a supply to tide over the when they are scarce. By freezing them at a temperatu 14° F. they can be stored for very long periods. They ha be frozen very quickly after being caught, otherwise the teria which found an entry before freezing would cause d immediately the fish were thawed. Freezing slightly spoil flavour of the fish.

There are two methods of preserving by cold: (1) **Fre** and (2) **Chilling.** In the freezing method the food is kept temperature a little below freezing point until it becomes fi



By courtesy of the High Commissioner for New Zealand

FROZEN MUTTON AWAITING SHIPMENT TO ENGLAND.

throughout, and after that the temperature is not allowed to rise above 32° F., thereby ensuring that the food will remain frozen.

It was in 1880 that the first cargo of frozen meat was brought from New Zealand, but now over a million tons of meat, either frozen or chilled, are imported every year. There is a certain disadvantage in the freezing of meat as the tubes containing the juice may burst and allow some of the nutritive constituents to be lost in what is called *drip*. Mutton, rabbit and fish lend themselves to freezing better than beef, which has to be dealt with in larger pieces and so is more difficult to freeze. In the method known as "Quick Freezing" the frozen juice forms smaller crystals which are not so likely to perforate the tubes as in the slower method where the crystals are larger.

In the chilling of food the temperature is not reduced to freezing point but is brought very near it ; this method is not so effective as freezing, for the growth of organisms, though checked, still continues at a slow rate. Meat is preserved by chilling, rather than by freezing, if the distance is such as to allow of that method being successfully adopted. There is then no loss by drip, and the meat will keep four weeks or double that time if kept in an atmosphere containing 20% carbon dioxide. The time of keeping is largely dependent on hygienic handling before preserving. Fruit and vegetables are chilled, not frozen, for the reason that they become greatly changed and lose much of their value if subjected to freezing ; the change in taste of a frosted vegetable is familiar to most of us.

The degree of humidity of the storage chamber is also a factor of much importance in the transport of foods. Soft fruits, which are very readily attacked by moulds, have to be kept in a dry atmosphere, while the harder stone fruits need a greater degree of humidity ; they shrink owing to the evaporation of moisture if the atmosphere is too dry.

Eggs make an excellent feeding ground for bacteria and are very readily attacked. They cannot be frozen, however, as this

causes the membrane surrounding the yolk to burst. To enable them to be transported they are chilled, and the humidity of the atmosphere is carefully regulated to prevent the growth of moulds, which gain access by penetrating the tiny pores of the shell.

If milk is protected as far as possible from the entrance of bacteria before storage it can be kept fresh for several weeks at 32° F.; this is very useful for ships and allows fresh milk to be served daily on long trans-oceanic voyages. Butter and cheese can also be preserved by chilling, but they must be kept wrapped so as to exclude air and thereby prevent the growth of mould which readily attacks them.

If chilled food is kept in an atmosphere which contains 10 to 20 per cent. of carbon dioxide, this enables it to be brought from a much greater distance. The amount of carbon dioxide must be kept within this limit, as an excess may affect the composition of the food; for example, if too much carbon dioxide is present meat turns brown owing to a change taking place in the pigment haemoglobin, a change similar to that which goes on in the production of impure blood in the veins of the body.

Preservation by Heat.—The chief difficulty in preserving by means of heat is the question of the bacterial spores which I mentioned earlier in the chapter; these are able to resist temperatures of well over 212° F., despite the fact that a temperature of 175° F. will kill most ordinary bacteria. With the use of an autoclave, however, sufficiently high temperatures can be got with steam under pressure to destroy these spores; the presence of acid makes them more easily destroyed.

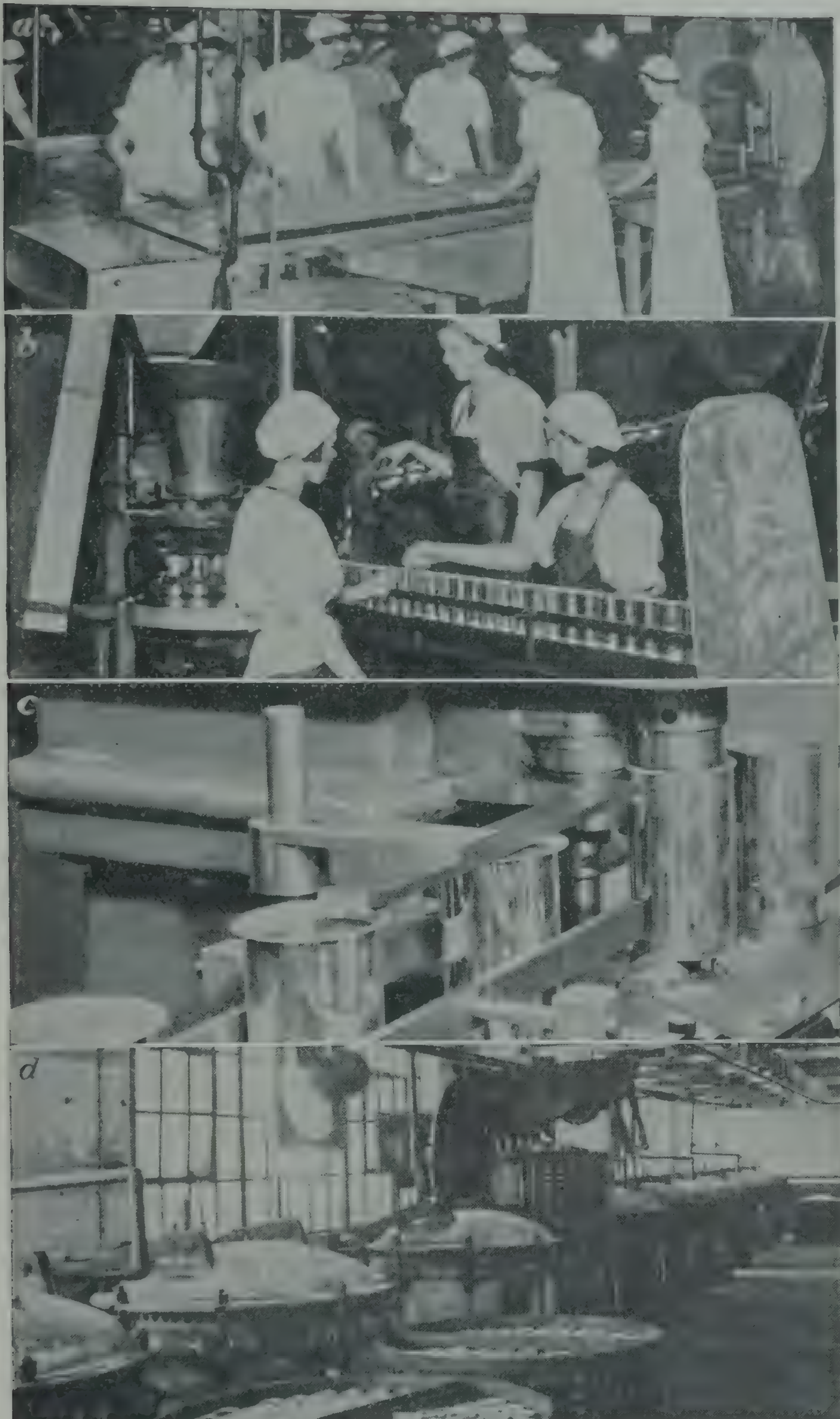
The method of preserving by canning dates back to the Napoleonic wars. As in all great wars, the food question then was a serious one and a large sum of money was offered for the invention of a good method of preserving food; the method used by the winner of the prize was a very crude form of bottling fruit. At that time little or nothing was known of the

science of bacteriology, and it was thought that the preserving effect was due to the exclusion of air and not to the destruction of bacteria by heat. Gradual improvements on this primitive pioneer effort have resulted in the great canning industry which we have to-day. This industry has made great improvements in recent years. The process is now carried out with the greatest care and under strictly hygienic conditions; the heating being done in vacuo, the vitamins normally destroyed by oxidation are to a great extent preserved.

For canning, the food must in the first place be fresh and as free from bacteria as possible. It is heated to a temperature above boiling point by the use of steam under pressure and, when still hot, is hermetically sealed in the tins. It is necessary to avoid too high a temperature, which would decompose the food, and at the same time it must be sufficiently high to kill all bacteria. Unless the tins are kept for an unreasonable length of time, decomposition is now rare, but if the tin bulges at places this is a danger sign, as the bulge has most likely been caused by a gas produced by the decomposition of the food. If a canned food when turned out of the tin shows by its appearance or smell the least sign of decomposition, it should be discarded; there may be danger even in tasting it.

Preservation by Drying.—As already stated, bacteria, yeasts and moulds all require a certain amount of moisture. If we reduce this sufficiently we prevent their attack, hence the appearance nowadays of many kinds of dried foods on the market (see page 47).

The preserving effect of salt and sugar solutions is also actually due to a drying process; owing to what the scientist calls "osmotic pressure" being set up by concentrated solutions of these substances, the water is not allowed to pass into the micro-organism. A twenty per cent. solution is sufficiently strong to prevent the growth of bacteria, while a sixty per cent. or seventy per cent. solution will prevent the growth of moulds. The amount of salt or sugar required depends, of course, on the



By courtesy of Messrs. Crosse & Blackwell, Ltd.

STAGES IN THE CANNING OF PEAS.

(*a*) Sorting after the preliminary cooking, (*b*) filling the cans, (*c*) sealing the cans, (*d*) autoclaves containing 6,000 tins each in which the cooking is completed by steam.

composition of the particular food and on the amount of water in it; for example, butter can be preserved with about three per cent. of salt, as this makes a strong solution with the small amount of water present in the butter, the fat being unable to dissolve the salt.

Smoking as used in the preserving of fish is a method of drying, but in addition to the actual removal of water a flavour is imparted, and probably also some preserving effect, by certain properties of the smoke.

Chemical Preservatives.—Many of the substances which inhibit the growth of bacteria, etc., have, unfortunately, a harmful effect on the body. Some years ago it came to be realised that a tremendous number of foods were being treated with preservatives, and that while the percentage of preservative present in any one food probably did no harm, the total amount from dose upon dose in different foods could be distinctly harmful. To remedy this, special regulations were drawn up by the national health authorities and came into force in 1927; these forbid entirely the use of the most harmful substances such as boric acid, salicylic acid, etc. They allow only benzoic acid and sulphurous acid and the salts of these to be used, and only in restricted quantities and in certain foods.

The law decrees that when a food contains preservative the fact must be clearly stated on a label so that people who wish to avoid such substances can do so. Some colouring matters are also forbidden and only those which are deemed to be harmless are allowed.

FOOD POISONING

We periodically come across cases of poisoning due to the eating of unsound food and usually caused by poisons produced by bacteria of the *Salmonella* group; unfortunately, food affected by these is not altered in appearance or taste to any extent. The poison brings on severe pain, sickness and diarrhoea, the

attacks varying from very slight ones which are quickly got over to more severe ones which may prove fatal.

Outbreaks of poisoning have frequently been traced to ice-cream. Owing to the low temperature, decomposition does not readily show itself and so stale milk unfit for sale is sometimes used by unscrupulous vendors ; it is therefore wise to purchase this delicacy from a reliable source.

Botulism is one of the most serious forms of food poisoning ; the bacteria which cause it grow only in the absence of oxygen and so it is invariably found associated with canned foods. It should be noted that the appearance of the food may not be sufficiently altered to allow it to be detected. The attack is characterised by nervous symptoms and is usually fatal. Fortunately, it is of very rare occurrence.

NEED FOR A CLEANER FOOD SUPPLY

The question of bacteria leads me also to discuss the methods of handling foods, both before and after they reach the home ; those who are observant will notice many instances of careless unhygienic treatment. For example, meat, etc., is often carried on errand boys' bicycles, or in open vans, with very little protection from the dust and dirt of the streets ; not long ago I observed a boxing match in progress on the street between a not overclean schoolboy and a baker's message boy, the latter making use of a Vienna loaf out of his van as a boxing glove. Such things would not happen if dealers in foodstuffs had a real regard for hygiene and took the necessary precautions ; fruit, confectionery, fish and other foods are too often exposed to dust and flies. Then there are still too many of those people who, with no hygienic conscience, blow into paper bags to assist them to open, moisten the finger with saliva to separate sheets of paper, etc., and we have all had experience of seeing the equally unhygienic woman purchaser who feels that she has not

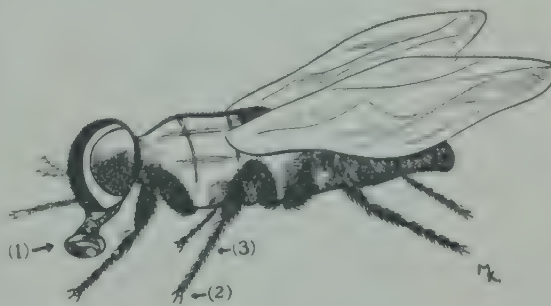
got a proper idea of the quality of meat unless she has fingered it as she would a piece of material in a draper's shop.

Milk is a food which suffers very greatly from unhygienic handling ; a tumblerful of some samples may contain as many as six hundred million bacteria, or even more. Pasteurising of all doubtful supplies of milk is therefore advisable, but after all, though it is certainly better to have the germs dead than alive, how much better it would be if we could have a national supply which was sufficiently clean to make such treatment as pasteurising unnecessary! The proper storage of food in the home is important for all foods but especially so for milk, and it is worth while to have a domestic refrigerator if only for milk alone. These refrigerators are now in very general use ; they are of great service in keeping food clean and fresh in the home, and in enabling the housewife to buy perishable food in larger quantities. This, besides being more economical, saves her many visits to the shops. If it is not possible to have a refrigerator, milk should be kept in as cool a place as possible and should be covered, preferably with a piece of clean muslin. It is perhaps unfortunate, in a way, that bacteria are so small as to be invisible ; if a glimpse could be got, for example, of the millions of bacteria in a tumblerful of milk, a greater effort would probably be made to avoid them.

An effective way of keeping milk in hot weather is to place the jug in a shallow dish containing a little water and lay over the jug a piece of wet muslin with the edge dipping into the water. This acts on the principle of the water coolers used in hot countries, the evaporation from the muslin causing withdrawal of heat from the jug and its contents.

The Fly.—Perhaps the most wicked offender of all, both in the shop and in the home, is the house fly. When compared with other insects such as the bee and the wasp the fly seems a very innocent creature but actually, owing to the germs which it carries, hundreds of people are indirectly killed by it every year. The legs and body of the fly are covered with tiny hairs

and at the extremity of its legs are pads which secrete a sticky substance, enabling the fly to walk upside down along a ceiling. A fly, having no teeth, has to have its food in a soft easily-swallowed form and, if it alights in the sugar bowl, it first puts some saliva over the sugar to dissolve some of it and then sucks up the solution; this saliva is, of course, probably teeming with germs. Its aesthetic tastes not being of the highest the fly greatly prefers dirty things to clean things as food, and in consequence you will invariably find flies wherever there is anything foul or decayed. There they gather myriads of germs with which they wing their way to our houses, alighting on the bread, butter and jam or drowning themselves in the unprotected milk jug.



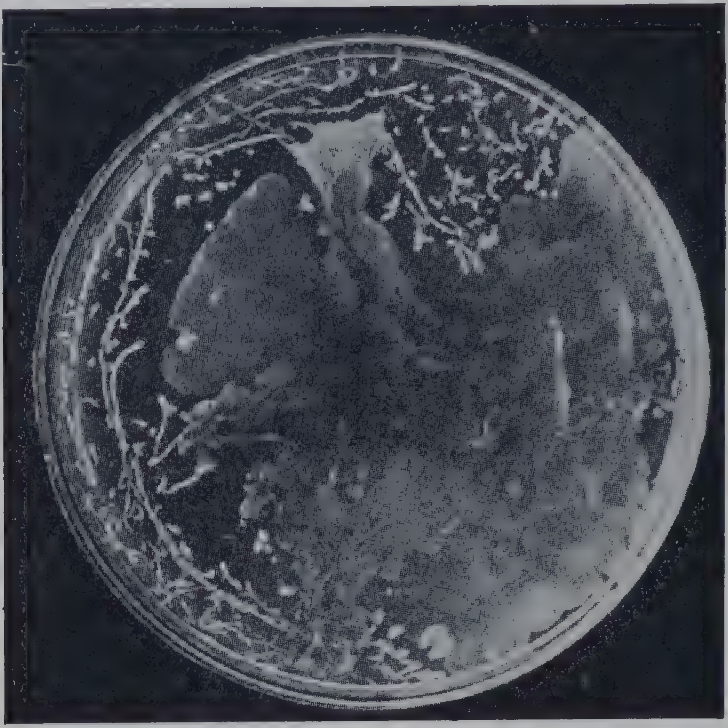
THE HOUSE FLY AS GERM CARRIER.

Note—(1) Trunk, (2) Glue pads, (3) Hairs.

This is no doubt a disagreeable topic but it is one which must not be shirked; the more we realise the danger the more careful we will be in protecting our food from the ravages of the fly. As already stated, milk jugs should be covered with a piece of clean muslin; meat should be protected by a wire cover, which can be bought very cheaply in the household stores; while butter, jam and all other foods which attract flies should also be thoroughly protected.

When a fly is about three weeks old it begins to lay eggs. It may lay a hundred or more at a time and one fly may produce eggs half a dozen times during the summer. The calculation of the number of descendants is thus a weighty arithmetical problem, but it has been estimated that for one fly the number could be eighteen thousand million. Fortunately, some of them perish!

Most flies die during the winter, being killed either by the col or by a disease caused by a fungus which attacks them. Thos which survive find some secluded nook, probably about th walls or furniture of a room, in which to hibernate; hence th need for spring cleaning every corner. May is the best time t



Culture of Bacteria after allowing a House Fly to crawl for Three Minutes over a Sterile Agar Plate.

(Reproduced from Herms' "Medical and Veterinary Entomology," by permission of The Macmillan Company, New York.)

wage war on flies, as there are fewer of them then; every fl killed in May means hundreds of flies fewer during the summe and autumn.

A fly will not readily enter a house unless invited and it is od scraps of food, crumbs and unprotected foods which invit it to come in; all such things should therefore be avoided If, despite your care, the fly does enter, do what you ca to destroy it by swatting it with a newspaper or other suit-

able weapon, or by the use of fly papers, etc. An effective fly-trap can be made by putting about three teaspoonfuls of formalin mixed with a little milk in a saucer and placing over this a piece of blotting paper, which absorbs the solution and keeps continually wet. The fly will alight on the blotting paper and suck up sufficient of the liquid to poison itself.

Effect of Public Opinion on Food Supply.—The national health authorities have done a tremendous amount to improve the hygienic quality of the food supply by periodical inspection, prevention of adulteration, etc., but some things are beyond their control. It should be remembered that public opinion is a very powerful factor and people could do much to effect fresh improvements in the food supply by withholding their patronage from shops where unhygienic methods of handling foods are practised. There is still, however, too much apathy in regard to the need for a cleaner food supply and we are apt too often to shut our eyes to what we do not want to see.

May the time not be far distant when all bread will be wrapped, all milk be of the standard now demanded by the highest grade, and when there will be no more flies to kill.

CHAPTER XV

THE GARDEN OR ALLOTMENT—ITS CONTRIBUTION TO A HEALTHY DIET AND HOW TO MAKE THE BEST USE OF IT

"The kiss of the sun for pardon,
The song of the birds for mirth,
You are nearer God's heart in a Garden
Than anywhere else on earth."

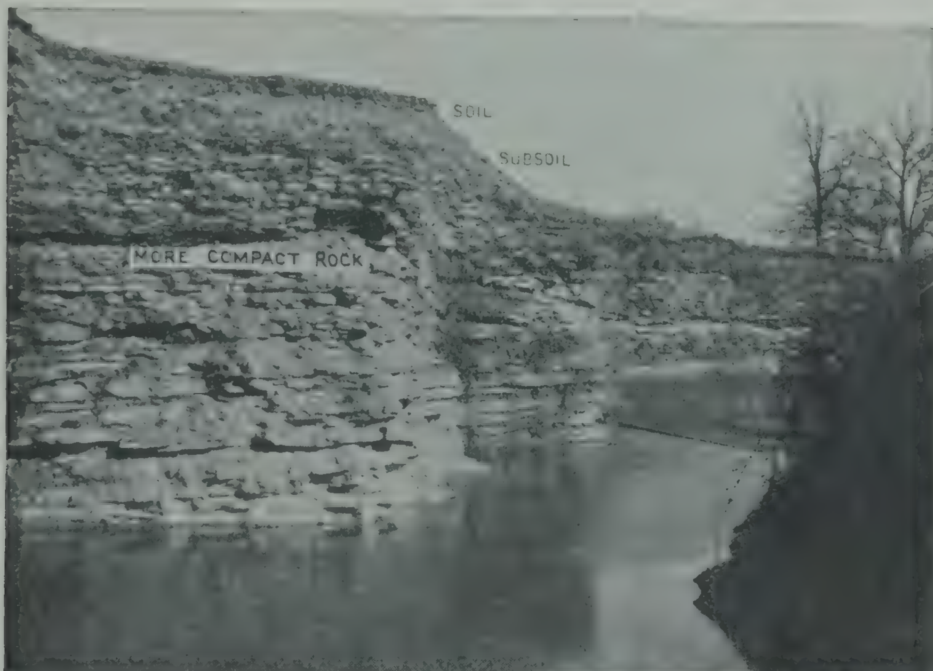
D. GURNEY

Benefits of a Garden.—Happy are they who possess a garden or, the next best thing to it, an allotment, be it ever so small. There is no pastime so beneficial to health as gardening ; the wielding of the spade, the rake and the hoe afford excellent exercise to every part of the body and, at the same time, the worker reaps the benefit of the sunlight and fresh air. It is supposed by some people that working with the soil has also some beneficial health-giving effect of its own, but probably the truth of the matter lies in the factors already mentioned. To those with a love for nature the garden affords an unending source of interest, and working in it is a splendid relaxation for those who have to spend much of their time indoors.

The superior value of vegetables and fruits which have been freshly pulled has already been commented on and, with a little experience, the gardener gets to know how to make the best use of the ground so that it will yield a supply of " stored sunshine " in the form of vitamin-containing foods during the dark days of winter as well as during the seasons of more abundant growth.

Preparing the Soil.—The first thing to consider in establishing a garden is the soil. The story of the formation of soils as told by the geologist is an interesting one. During the Ice Age huge

glaciers crushed the rocks, reducing them to a powder, and further disintegration—which is still going on—was brought about through the expansion by frost of water that had entered the cracks. It is this powdered rock which forms the mineral matter so necessary for plant growth, and plants and animals living and dying have gradually pulverised and enriched it with organic matter; the latter is known as humus and to it the dark colour of the soil is due.



By courtesy of the Director, Geological Survey

PART OF A QUARRY SHOWING SOIL, SUBSOIL AND ROCK.

If a trench is dug deep enough it will be found that the soil extends only for a limited depth and that beneath it is rock; just above the rock is a part which is lighter in colour and more stony than the top soil, and this is known as the subsoil; above it lies the ordinary soil, in which plants grow. They cannot do so without air, and to provide them with this the top soil has to be loosened by digging.

There is no special time for this loosening process; it will

depend on when the ground is free from plants, and on the st of the weather ; it should not be done during frost, nor when t ground is saturated with rain. To produce the best resu digging must be deep ; the spade must be inserted its wh length and in an almost perpendicular direction. It is best have the digging done at least a month before planting and t soil will also probably benefit by being raked, to break down a lumps, just before the seeds or plants are to be put in. Manu should be introduced at the time of digging, and care taken have it evenly distributed. Farmyard manure is best but, this cannot be got, some artificial manure such as bone me should be used. Decayed vegetable matter is also of use. So is doubly valuable for, besides being a food for plants, it kee away insects and slugs.

After a soil has had continued doses of manure from year year it sometimes becomes acid, and in this condition is u healthy for the plants ; such a soil is very dark coloured and described by the gardener as " sour ". To remedy the conditi lime should be used, about one pound being sufficient for o square yard ; it should be sprinkled evenly over the surface a then dug in. It is not advisable, however, to put in manure the same time as lime and a month or two should elapse betwe the two treatments to allow the lime time to take effect. T soil may contain lime naturally, as one of its constituents, b this gradually becomes used up by the plants and requires to renewed. Besides destroying the acidity of the soil, lime pu verises it and allows free access of air, thus making it mo healthy for plant growth. It is sufficient to lime dress once three or four years.

Sowing the Seeds.—Seeds require moisture, warmth and a hence they should not be sown too soon or too deep. The dep of sowing depends generally on the size of the seeds ; very ti seeds like lettuce should be sown about half an inch deep, tho like carrot, parsnip and onion about one inch deep, peas abo three inches deep and beans about four inches deep. A ve

By courtesy of the Rothamsted Experimental Station

EXPERIMENT ON WATER CULTURE SHOWING IMPORTANCE OF MINERAL SUBSTANCES ON PLANT GROWTH.

a—complete. *b*—no sodium. *c*—no sulphur. *d*—no magnesium. *e*—no phosphorus. *f*—no iron. *g*—no calcium. *h*—no potassium. *i*—no nitrogen.

common mistake is to sow too thickly ; this produces wea plants, and even though they are thinned they may never quit recover. The same applies to seedlings when they are plante out ; plenty of room should be left to allow of proper growth It is important that seeds should be fresh and it is, accordingly not advisable to use those which have been left over from th previous year.

Rotation of Crops.—The importance of mineral substances to the plant cell can be shown by experiments on water culture Plants are grown in various solutions, one of these containing all the substances necessary for growth and being used as a control ; in each of the other solutions some substance is omitted and the effect on the growth of the plant is observed. The illustration on page 153 shows results of an interesting experiment of this kind carried out with a variety of bean. The plant marked *a* was grown in the complete solution and showed normal development ; *b* was grown in a solution which lacked sodium and this was found to have no injurious effect on its growth ; plant *c* had no sulphur, with the result that the leaves were yellow and the plant was small and generally weak ; with no magnesium, as in *d*, the leaves were yellowish and had a somewhat mottled appearance ; plant *e* had no phosphorus and this had a very marked effect, the growth being very much restricted and a small plant with small dark leaves being the result ; with no iron, as in *f*, the plant reached a good size but the leaves were very yellow and later became black ; the omission of calcium, as in *g*, was most disastrous, there being practically no growth in the root or in the shoot ; where there was no potassium, as in *h*, the leaves, especially the older ones, tended to wither and fall off ; in the last bottle, where the plant was deprived of nitrogen, the root was very much developed but the plant itself was weak and growth was poor.

Plants vary in their needs with regard to these mineral elements and each form of crop takes different substances from the soil. For this reason the same vegetable should never be

grown in the same part of the garden in successive years; cabbages and potatoes are specially greedy and should therefore not be grown at all unless there is abundant space for changing them. One system of rotation is to divide the space into three parts; let us call these A, B and C. In A, the first year plant potatoes, leeks, carrot and celery. In B, put peas, beans and onions, and spring cabbage may be planted after the peas and beans are finished. In C, plant cabbage, Brussels sprouts, etc. In the following year, what was in A is planted in B, what was in B is planted in C, what was in C is planted in A and so on, continuing this change-round each successive year.

It is important that the rows of vegetables should lie in a north-south direction as this enables them to obtain a maximum amount of sun.

What to Plant.—The kind of vegetables planted will depend on individual choice and on the amount of ground available. If there is sufficient space, root vegetables should be grown and stored for use during the winter and, in addition to these and green vegetables for immediate use, a few herbs should be put in—for example, sage, thyme and mint; they are easy to grow, take up little space, and make excellent flavouring.

The following are the most useful types of vegetables:

Cabbage.—Cabbages require a rich ground. The early Spring plants are the most popular, as they are ready for use before the greater variety of vegetables have come on. The seed for these should be sown in July, preferably after peas or beans, as these enrich the soil; the seedlings must be planted out as soon as they are large enough. The early spring variety is a small form of cabbage but practically the whole of the plant can be used, as there are few coarse leaves. For use during the summer, cabbage may be planted in March. All forms of cabbage can be grown either from seed or by buying young plants; the former method is preferred, as a better type of plant can usually be got thereby. If, on buying plants, it is found that some of them have small knots on the roots these should be separated from the

unaffected ones and discarded, this being a sign of the diseas called club root.

Cabbage is usually cooked, but at the time when gree material for salads is scarce, the tender leaves in the centre ca be satisfactorily used for these. Cabbage yields a liberal suppl of vitamins A and C, and is also rich in alkaline salts. Lik other green vegetables, it supplies more roughage than do root and tubers.

Kale, or—as it is commonly called in Scotland—*curly greens* is a variety of cabbage but does not contain a solid heart like th ordinary cabbage ; it is a very good winter vegetable with th usual health-giving properties of green vegetables. In thi connection, a story is told about a doctor who bought a practic in a small village in Fife, only to leave it in a short time. A friend, commenting on the beauty of the district, asked why h had left it so soon. The reply was, " Well, people are never il there ; they eat too many leeks and curlies."

The *Savoy* is another form of cabbage ; it may be planted a the same time as the ordinary cabbage but its growth is slowe and we may have savoys as late as February.

Cauliflower.—This belongs to the same family of plants as th cabbage, but it is a rather fastidious member and requires a rich soil and ample shelter. It should be planted about March o April and will be ready for use in July or August. It is one of th lightest of vegetables and is useful in invalid diet.

Brussels Sprouts.—These are very useful during times o vegetable scarcity. They require good soil and can be bought a seedlings and planted in June, care being taken to keep th plants well apart to allow for subsequent growth. They ma also be grown from seed, sown in March or April ; in either cas the vegetable will be ready for use the following winter. I should be noted that in gathering the sprouts it is better to cu them off with a knife, for pulling them off roughly interfere with the growth of the plant. Their food value is very similar t that of cabbage. They are particularly rich in vitamin C.

Broccoli is another winter vegetable. The seedlings may be planted out in June and again in August; they can quite well be planted after some vegetable which has had its season. Broccoli has a very high vitamin C value.

Asparagus Kale and Purple Sprouting Broccoli are two comparatively new varieties of vegetable. The former is very prolific and if the young leaves are picked when they are two or three inches long the plant will continue to sprout for some time. As these vegetables are ready for use in February and March they bridge the gap between Brussels sprouts or savoys and the spring cabbages.

Lettuce may be first sown in April and by continuing to sow small quantities about every fortnight throughout the summer a regular supply for the salad is assured; the seedlings should be thinned and can be transplanted successfully. Lettuce forms the basis of many salads. Besides having the general nutritive qualities of green vegetables it is also good for counteracting sleeplessness; in fact, the milky fluid which can be abstracted from it used to be known as Lettuce Opium, though it has no real relation to that drug, and its soporific properties are very mild. Its vitamin C value, however, is disappointing.

Cress is most tender when grown in a frame and with successive sowings can be kept going for the greater part of the year if desired; if grown outside it is coarser. It forms an excellent addition to a salad, being rich in vitamins and iron.

Spinach.—This requires a lot of moisture and is best planted where it will be slightly shaded by other plants. It is better than any other vegetable for supplying roughage and is a good source of vitamins A and C. It is rich in iron, but it is now known that the iron present is not all made use of in the body and its value in this respect is not so high as it was once considered to be. It is also rich in calcium but very little of this is available. All the leaves of Spinach should not be removed from the plant at the same time; the larger ones should be taken first, this producing better growth. It will be found that

the leaves are usually gritty, hence they must be thoroughly cleansed.

Onions.—To get onions to grow well the gardener must be good to them ; they require well-dug, well-manured soil. The seeds are sown in March, or young plants may be bought and planted then ; they may also be sown in the Autumn to produce a crop early in the Spring. When the plants are well rooted the soil should be cleared away round the bulb, thus making the bulb firmer and preventing rotting and sprouting. Any surplus supply of onions may be pickled with vinegar, and small spring onions make an excellent addition to a salad.

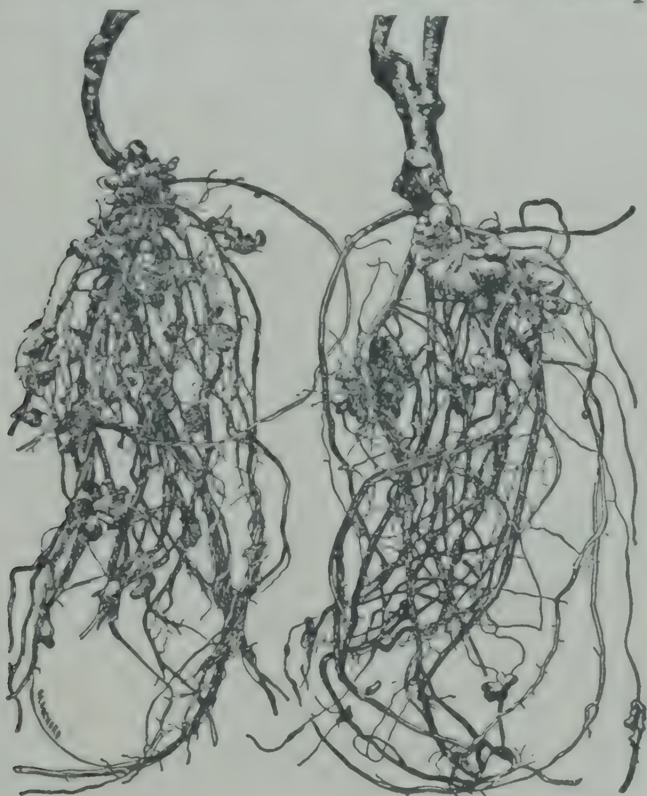
The onion is one of the oldest of vegetables, its cultivation dating back to the ancient Greeks and Romans. There are a great many varieties, all of which have valuable health-giving properties. The taste and smell are due to an acrid oil ; those grown in warm countries, viz., Spanish onions, have not so much of this oil and so are less strongly flavoured. Onions are very beneficial in cases of constipation ; they should not be eaten in excess, however, as the oil may irritate the digestive tract. Like lettuce, they have a slight soporific effect, and if a small piece of Spanish onion is finely chopped and taken just before going to bed it will help to induce sleep.

Leeks.—The seed for these should be sown in March. When the plants are about eight inches high they should be dibbled into a prepared bed of rich soil to a depth of about six inches ; this depth of planting helps to blanch them and of course it is the blanched part which is wanted.

Celery.—This has the advantage of being a winter vegetable but it is rather troublesome to grow and requires careful nursing. The seeds must be sown in early spring, in a frame or greenhouse, the seedlings being transplanted outside when they have fully established their growth. The stems have a strong flavour which makes them useful as an appetite stimulant, and in old medical records celery is frequently recommended as a cure for rheumatism ; it is doubtful, however, whether it is any more

effective for this purpose than any other vegetable. It is good for the soil and will improve crops which follow it.

Parsnips.—The parsnip is another useful vegetable. It can be sown as early as the ground will permit. Parsnips can be left



Roots of Leguminous Plant showing Nodules of Nitrifying Bacteria.

(Reproduced from S. M. Elliott's "Household Bacteriology," by permission of The American School of Home Economics.)

in the ground during the winter if the tops are covered to protect them from frost. They contain a little fat, which is unusual in a root vegetable; the carbohydrate is partly sugar and partly starch but there is not very much of either present and the parsnip's most valuable constituents are its alkaline salts and roughage.

Jerusalem Artichokes.—These are very hardy plants and the seeding sections can quite well be planted in February; they

will then be ready for use in the following Autumn and Winter.

Broad Beans.—These also stand cold quite well and may be planted in February. They belong to what is known as the leguminous type of plant, which has the power of making use of the nitrogen in the atmosphere. All plants require nitrogen and most of them get it from the soil or from manure in a combined form as nitrates ; the leguminous plants, however, are able to make use of the nitrogen of the air through the agency of little nodules which are in their roots. These nodules contain bacteria which take the nitrogen from the air and make it into an organic substance which they pass on to the plant, getting from it some carbohydrate in exchange. For this reason, this type of plant is particularly rich in protein, as was indicated in Chapter III ; broad beans are also rich in starch and contain vitamins B and C.

French Beans.—These are more delicate than the broad beans and should not be sown earlier than May ; they grow well between rows of peas and, in addition, space is saved by sowing them in this way.

Peas.—Peas should be sown partly of early and partly of late varieties, so that they will not all be ready at the same time ; if they are first sown in March and a later sowing is made at the end of May, a supply of this delightful and very nourishing vegetable will be available for quite a long period. The pea, being also a leguminous plant, its food value is very similar to that of the bean.

Turnip.—Turnips are fairly hardy and the first sowing can be made in February and then at intervals till June or July ; the seedlings must be thinned as soon as they appear. Of the two well-known varieties, the Swede and the Yellow turnip, the former is the more valuable as a food by reason of the fact that it is a very good source of vitamin C ; the latter contains none.

Potato.—It is not worth while growing potatoes unless a fairly large piece of ground is available ; it is an advantage to grow them if the area allows it, however, for early potatoes can

be got at a time when they are very dear in the shops. They may be planted as early as March but when the plants appear they must be protected against severe frost; it is better if the seed potatoes have come from a climate rather colder than that in which they are to be grown. When the plant is a few inches high the earth should be drawn well up round the roots. In later varieties it is advisable to spray in July with Bordeaux mixture, to prevent disease, but this is not necessary with the earlier kinds. If potatoes are grown year after year in the same place it is better to change the variety.

Just under the skin of the potato is a layer which is rather denser than the rest, known as the fibro-vascular layer; this contains most of the alkaline salts and vitamins, hence the advantage of cooking potatoes in their jackets. The potato contains rather more carbohydrate in the form of starch than do most other vegetables, but it is chiefly of use for its alkaline salts. To the potato is attributed the special power of preventing rheumatism, and there is a peculiar belief that carrying a potato in one's pocket will ward off that complaint; probably, however, it would be more effective if one ate it!

Carrots.—It is as well to make two sowings of carrots, so as to get a continuous crop; they are best sown in March, April and May. When the seedlings appear they must be carefully thinned. In some districts it is very difficult to grow them owing to the ravages of the carrot fly, but spraying with a mixture of about one wine-glassful of paraffin to four gallons of water will help to keep the fly off.

Carrot is a vegetable which has come into much prominence of late owing to its high vitamin value; the bright colour is due to the substance called carotene and, as we have learned, it is this which supplies the vitamin. The carbohydrate is in the form of sugar.

Beetroot.—These should not be sown till the second half of April, or in May. As soon as the seedlings have appeared they should be thinned, but it is not advisable to try to transplant

either these or carrots. Beetroot is very similar to carrot in composition.

Herbs.—The "Sweet herbs", as they are sometimes called because of the fragrant smell many of them possess, should find a place in the garden far more often than they do; they are very useful for flavouring and also have a slight antiseptic effect in the alimentary canal. Though they need a fairly rich soil they are easily grown and can be planted in any odd patch of ground. The most useful herbs are mint, thyme, sage and parsley. Herb seeds are sown just like vegetable seeds but those which are perennials, such as sage and thyme, can usually be grown from cuttings.

Mint is used in making the familiar mint sauce. It has for long been regarded as a cure for flatulence hence it is sometimes used along with the pulses or with new potatoes, which are liable to cause this.

Parsley.—There is no more effective garnish than parsley, with its fresh green colour, and it is also very useful for flavouring sauces, etc. Its vitamin C value is particularly high.

Sage is often combined with onions in making a sauce to serve with pork, etc.

Thyme.—This, when mixed with other herbs, makes a good flavouring material for stuffings.

Herbs are certainly best when fresh, but they can be satisfactorily dried and stored to provide a supply for the winter; when this is done at home they are usually better than the dried herbs which are got in the shops. They should be picked on a dry day just before they have flowered. The leaves should be separated and spread on a tray or baking sheet and dried in the sun or in a very cool oven; it is most important that the oven should be cool else the herbs will lose their green colour and become scorched and brown. When they are thoroughly dry and brittle they can be powdered by rubbing between the hands or by putting through a coarse sieve; they are then ready to be stored in covered tins and used as required.

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